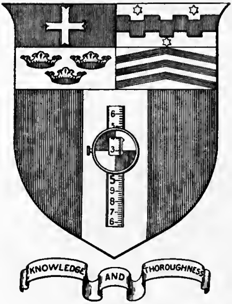
William C. Thum.
1924.



Coat of Arms, 1904

Old Bank Place. Occupied, 1824–34 and 1841–44

HISTORY

OF

Rensselaer Polytechnic Institute

1824-1914

BY

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TO THE MEMORY

OF

Stephen Van Rensselaer

AND

Amos Eaton

PREFACE

HAVING recently been compelled to write several brief historical sketches of the Institute, the writer became interested in its early history. In preparing these narratives he found the official publications giving the characteristics of the School at the time of its foundation to have become very rare. In fact, very few of them antedating 1840 are known to be in existence. For these reasons he determined to expand the sketches and publish a short history of the Institution which should consist largely of a description of the development of its curriculums.

The student of the history of education will recognize the importance of an account of the early methods of instruction pursued in an institution which was, at once, the first School of Science* and the first School of Civil Engineering to be established in any English-speaking country, and if the conceded originality of these methods be also considered, it is believed that no excuse for the appearance of this somewhat condensed narrative will be thought necessary.

Interesting information has been obtained from the recently discovered original minutes of the board of trustees for the twenty-five years immedi-

* See Preface to the Second Edition.

ately following the founding of the School, which were believed to have been destroyed in the fire of 1862, and the thanks of the writer are due the President and Secretary of the present board for placing at his disposal the minutes covering the period from 1862 until the present time.

The author is also under obligation to Prof. Henry B. Nason for the loan of a number of the early circulars, to A. J. Weise, Esq., for the picture of the Van Der Heyden mansion; to James Irving, Esq., for that of the building on the Infant School Lot, and to Prof. William G. Raymond for the two photographs from which the pictures showing railroad and hydrographic work of students were taken. The Bibliography at the end of the last chapter shows other sources whence information has been obtained. P. C. R.

RENSSELAER POLYTECHNIC INSTITUTE,
TROY, N. Y., January 1, 1895.

PREFACE TO THE SECOND EDITION

TWENTY years have elapsed since the appearance of the first edition of this history. Many changes have taken place in the Institute during this period. It has become a larger school; more courses of instruction are given; there are more teachers and more students, more buildings and larger ones, a far better equipment, and a larger endowment. Its field has been broadened and its standards for graduation have been raised.

In the first preface, the Institute is said to be the first School of Science and the first School of Civil Engineering to be established in any English-speaking country. In the first chapter of this edition it is shown that this statement should be modified; that there was one school established, as the Rensselaer School was, primarily for the teaching of Science, which antedated it by about two years, but which soon passed out of existence. It is, therefore, more correct to say that the Institute is the first School of Science and the first School of Civil Engineering, which has had a continuous existence, to be established in any English-speaking country.

P. C. R.

RENSSELAER POLYTECHNIC INSTITUTE,
TROY, N. Y., November, 1914.

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HISTORY

OF

RENSSELAER POLYTECHNIC INSTITUTE

(1824-1914)

CHAPTER I

THE FOUNDATION OF THE SCHOOL

At the beginning of the nineteenth century the study of the physical sciences in the United States was in its infancy. All branches were included under the terms Natural Philosophy and Natural History. Their meaning was not well defined, although under the latter was generally included all of what was then known of astronomy, physics, chemistry, botany, and geology. Scarcely any provision was made for scientific instruction in any of the colleges of the country. Astronomy, physics, chemistry, and botany had indeed been taught during the preceding century in a few institutions of learning, a department of Mathematics and Natural Philosophy having been created at Harvard College as early as 1727, a professorship of Botany in Columbia College in 1792, and a chair of Chemistry at Princeton in 1795. Instruction had also been given in physics and chemistry at the University of Pennsylvania and Dartmouth College, and in physics at Union College. This short list, however, includes all the colleges which had given

the physical sciences more than an insignificant place in their curriculums. Even in these the instruction was given by lectures, supplemented at times by experiments which the teachers performed; and anything approaching laboratory work by the student was almost wholly unknown. When Prof. Silliman was elected, in 1801, to the chair of Chemistry, Geology, and Mineralogy at Yale College, he visited Dr. Maclean, who was professor of Chemistry at Princeton, and then for the first time saw experiments in chemistry performed.* Considering the state of scientific knowledge at this period and the general lack of opportunity for the study of science even in Europe, it is not remarkable that this should have been the case in a new country the total population of which in the year 1800 scarcely exceeded that of the city of London to-day.

With the general awakening to the value of the natural sciences, during the first quarter of the century, came provision for their study in other of the academic schools of the country. Within that time courses in various branches were inaugurated at Yale, Williams, Bowdoin, Dickinson, William and Mary, and Hobart Colleges, and in the universities of Georgia, North Carolina, and South Carolina. Facilities for practical work by the students were still wanting in nearly all of them, though the apparatus used for illustration had grown in quantity and variety. A chemical laboratory, already men-

* Education in the United States, Richard G. Boone.

tioned, was in existence at Princeton, one was fitted up at Williams College in 1812, and one at Harvard shortly after this date. A few others were also to be found. They were all, of course, crude and unpretending compared with those thickly scattered over the country to-day. Nor were the steps taken in the study of science always forward. Thus there was organized in the University of Pennsylvania, in 1816, a department of Natural Science "with five professors; and annual courses of lectures, to be publicly delivered, were required by the regulations. The courses of instruction embraced natural philosophy, botany, natural history, mineralogy, chemistry applied to agriculture and the arts, and comparative anatomy. The support given by the public, however, was not sufficient to compensate for the efforts put forth, the professors were badly paid, and the department soon fell into neglect. It was abolished shortly after the establishment of the Franklin Institute, in 1824, which rendered, it was said at the time, such a department in the university 'unnecessary.'" *

The time had now come, not only for the addition of scientific courses to the curriculums of the institutions of learning, but for a general diffusion of scientific knowledge among those who could not have the advantage of an education higher than that afforded by the common schools. Attempts in this direction had already been made in Europe.

* Historical Sketch of the University of Pennsylvania, John L. Stewart. Circular No. 2, 1892, of the U. S. Bureau of Education.

When Count Rumford returned from Munich to London in 1795 he endeavored to interest the people of England, as he had those of Germany, in his plans for public and domestic economy, more particularly in the economical consumption of coal, improvements in the construction of fireplaces and the heating of buildings by steam. In 1799 he issued in London a prospectus entitled "Proposals for forming by subscription, in the metropolis of the British Empire, a public institution for diffusing the knowledge and facilitating the general introduction of useful mechanical inventions and improvements, and for teaching, by courses of philosophical lectures and experiments, the application of science to the common purposes of life." The result was the establishment, in the year 1800, of the Royal Institution of Great Britain, which had for its object the purposes outlined in his prospectus.

Other men had not been blind to the benefits which would accrue to civilization if the people generally could be instructed in the application of science to the common purposes of life. Franklin's opinions upon this subject are well known. John Adams believed that the State should make provision for this purpose, as is shown by the following extract from the Constitution of Massachusetts, of 1780, of which he was the principal author: "to encourage private societies and public institutions, rewards and immunities for the promotion of agriculture, arts, sciences, commerce, trades, manufactures, and a natural history of the country."

Jefferson also proposed a school of technical philosophy, to be maintained wholly at public expense, where certain of the higher branches should be taught in abridged form to meet practical wants. "To such a school," he wrote, "will come the mariner, carpenter, shipwright, pump-maker, clock-maker, machinist, optician, metallurgist, founder, cutler, druggist, brewer, vintner, distiller, dyer, painter, bleacher, soap-maker, tanner, powder-maker, salt-maker, glass-maker, to learn, as much as shall be necessary to pursue their art understandingly, of the sciences of geometry, mechanics, statics, hydrostatics, hydraulics, hydrodynamics, navigation, astronomy, geography, optics, pneumatics, acoustics, physics, chemistry, natural history, botany, mineralogy, and pharmacy." *

The influence of such opinions gave impetus to the diffusion of scientific knowledge among the people of this country. Although, as before shown, opportunities had been offered in various colleges and universities for the study of natural science and the Royal Institution for popular lectures on its various branches had been founded in England, there had not been in existence in either country a school originated avowedly for purposes of scientific instruction. During the first quarter of the nineteenth century, however, three schools were established here for each of which the distinction has been claimed of being the first school created in any

* Early History of the University of Virginia, as contained in the letters of Thomas Jefferson and Joseph C. Cabell. Edited by J. W. Randolph, Richmond, 1856.

English-speaking country for the purpose of teaching science. The earliest was established in Norwich, Vermont, in 1819, by Captain Alden Partridge, a graduate of the United States Military Academy and its Superintendent during the years 1815–1817. It was called the American Literary, Scientific, and Military Academy, and it appears * to have been more of a military academy than a school of science. It was evidently modeled after the West Point school. The cadets lived in barracks, and were taken at as early an age as nine years. The curriculum included various languages, English literature, science, as much as was then known of engineering, and many military subjects, including military exercises. The Academy was moved from Vermont to Middletown, Connecticut, in 1825, and was incorporated in that State, but was disbanded in 1829. In the meantime, Captain Partridge had left the Academy in 1827 and had opened in Norwich a small preparatory school. When the Academy was disbanded in Connecticut, he took its name again for his school, which in 1834 was chartered by the legislature of Vermont as Norwich University, and, in 1866, the University was moved to Northfield, in the same State.

The second school was incorporated under the name of the Gardiner Lyceum, in Gardiner, Maine, in 1822, and opened in 1823 by Benjamin Hale, who was graduated from Bowdoin College in 1818 and who afterwards became President of Hobart

* History of Norwich University, by William A. Ellis. Vol. I, pp. 4–6, 13, 19–51.

College. In his inaugural address * delivered January 1, 1823, he said: "It is the object of this institution to give instruction in those branches which are most intimately connected with the arts, and to teach them as the foundation of the arts." "It is not sufficient for them, as for the general scholar, to be taught the general laws of chemistry; they must be instructed particularly in the chemistry of agriculture and the arts. It is not sufficient for them to be able to repeat and to demonstrate a few of the general laws of mechanics; they must be taught the application of the laws. They must be made acquainted with machines." The curriculum included various branches of pure mathematics, and natural science, mensuration, surveying, navigation, and theoretical and practical mechanics. The Lyceum existed for about ten years. It was discontinued in consequence of the withdrawal of a legislative appropriation.

The third school, which is the subject of this history, was founded in Troy, New York, by Stephen Van Rensselaer, of Albany, New York, in 1824. It was called the Rensselaer School, and was originated for the purpose of teaching the "application of science to the common purposes of life." Detailed information regarding it, including its early curriculums, will be given in due course in

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* An Inaugural Address delivered at Gardiner, Me., January 1, 1823. By Benjamin Hale, Principal of the Gardiner Lyceum, and Lecturer on Natural Philosophy. Hallowell. S. K. Gilman, Printer, 1823. A copy of this address, together with several other pamphlets relating to the Gardiner Lyceum, is in the Bowdoin College Library.

this history, and this reference is made at this time only to give the date of its foundation and its object, in order that a comparison may be made with the two schools previously mentioned.

The primary object of the Norwich Academy was really not the teaching of applied science. It seems to have been a mixture of boarding-school, military academy, classical school, and scientific school. Evidently more applied science, and even engineering, as it was then known, was taught than was taught in the classical colleges of that day. But even if, after all the changes in name and place, Norwich University may be said to be the same school as the American Literary, Scientific, and Military Academy, it is more than doubtful whether it has any right to be called the first school of science to be established in this country. If it has a claim to this distinction, the West Point Military Academy, after which it was modeled, has a greater claim; and this has never been made for it.

Whatever honor may accrue from being the first school established in this country specifically for the purpose of teaching science belongs, I believe, to the Gardiner Lyceum, which was originated about two years earlier than the Rensselaer School, but which soon ceased to be. The Rensselaer Polytechnic Institute is, therefore, I believe, the first school of science and engineering, which has had a continuous existence, to be established in any English-speaking country.

That the founder had definite ideas not only in relation to the purposes of the institution, but

also in regard to its general management and the methods of instruction to be pursued, is attested by a letter dated November 5, 1824, to the Rev. Samuel Blatchford, of Lansingburgh. It forms the first official notice of the foundation, and reads as follows:

"Dear Sir: I have established a school at the north end of Troy, in Rensselaer county, in the building usually called the Old Bank Place, for the purpose of instructing persons, who may choose to apply themselves, in the *application of science to the common purposes of life.* My principal object is, to qualify teachers for instructing the sons and daughters of farmers and mechanics, by lectures or otherwise, in the application of experimental chemistry, philosophy, and natural history, to agriculture, domestic economy, the arts, and manufactures. From the trials which have been made by persons in my employment at Utica, Whitesborough, Rome, Auburn, and Geneva during the last summer, I am inclined to believe that competent instructors may be produced in the school at Troy, who will be highly useful to the community in the diffusion of a very useful kind of knowledge, with its application to the business of living. Apparatus for the necessary experiments has been so much simplified, and specimens in natural history have become subjects of such easy attainment, that but a small sum is now required as an outfit for an instructor in the proposed branch of science; consequently, every school district may have the benefit of such a course of instruction about once

in two or three years, as soon as we can furnish a sufficient number of teachers. I prefer this plan to the endowment of a single public institution for the resort of those only whose parents are able and willing to send their children from home or to enter them for several years upon the Fellenberg plan. It seems to comport better with the habits of our citizens and the genius of our government to place the advantages of useful improvement equally within the reach of all.

"Whether my expectations will ever be realized or not, I am willing to hazard the necessary expense of making the trial. Having procured a suitable building advantageously located among farmers and mechanics, and having furnished funds which are deemed sufficient by my agent in this undertaking for procuring the necessary apparatus, etc., it now remains to establish a system of organization adapted to the object. You will excuse me if I attach too much consequence to the undertaking. But it appears to me that a board of trustees to decide upon the manner of granting certificates of qualifications, to regulate the government of students, etc., is essential. I, therefore, take the liberty to appoint you a member and president of a board of trustees for this purpose. I appoint the following gentlemen trustees of the same board: The Rev. Dr. Blatchford and Elias Parmalee, of Lansingburgh; Guert Van Schoonhoven and John Cramer, Esqs., of Waterford; Simeon De Witt and T. Romeyn Beck, of Albany; John D. Dickinson and Jedediah Tracy,

of Troy. And I appoint O. L. Holley, Esq., of Troy, and T. R. Beck, of Albany, first and second vice-presidents of said board.

"As a few regulations are immediately necessary in order to present the school to the public, it seems necessary that I should make the following orders, subject to be altered by the trustees after the end of the first term.

"*Order* 1. The board of trustees is to meet at times and places to be notified by the president, or by one of the vice-presidents, in the absence or disability of the president. One-half of the members of the board are to form a quorum for doing business. A majority of the members present may fill any vacancy which happens in the board; so that there may be two members resident in Troy, two in Lansingburgh, two in Waterford, and two in Albany. The powers and duties of the trustees to be such as those exercised by all similar boards, the object of the school being always kept in view.

"*Order* 2. I appoint Dr. Moses Hale, of Troy, secretary, and Mr. H. N. Lockwood, treasurer.

"*Order* 3. I appoint Amos Eaton, of Troy, professor of chemistry and experimental philosophy, and lecturer on geology, land surveying, and the laws regulating town officers and jurors. This office to be denominated the senior professorship.

"*Order* 4. I appoint Lewis C. Beck, of Albany, professor of mineralogy, botany, and zoology, and lecturer on the social duties peculiar to farmers and mechanics. This office to be denominated the junior professorship.

"*Order* 5. The first term is to commence on the first Monday in January next, and to continue fifteen weeks. For admission to the course, including the use of the library and reading-room, each student must pay twenty-five dollars to the treasurer, or give him satisfactory assurances that it will be paid in one year. In addition to this, each section of students must pay for the chemical substances they consume and the damage they do to apparatus.

"*Order* 6. All the pay thus received by the treasurer, as for parts of courses of instruction, is to be paid over to said professors as the reward of their services.

"*Order* 7. In giving the course in chemistry, the students are to be divided into sections, not exceeding five in each section. These are not to be taught by seeing experiments and hearing lectures, according to the usual method. But they are to lecture and experiment by turns, under the immediate direction of a professor or a competent assistant. Thus by a term of labor, like apprentices to a trade, they are to become operative chemists.

"*Order* 8. At the close of the term each student is to give sufficient tests of his skill and science before examiners, to be appointed by myself, or by the trustees, if I do not appoint. The examination is not to be conducted by question and answer, but the qualifications of students are to be estimated by the facility with which they perform experiments and give the rationale; and cer-

tificates or diplomas are to be awarded accordingly.

"*Order* 9. One librarian, or more, to be appointed by the professors, will be keeper of the reading-room. All who attend at the reading-room are to respect and obey the orders of the librarian in regard to the library and conduct while in the room.

"*Order* 10. Any student who shall be guilty of disorderly or ungentlemanly conduct is to be tried and punished by the president or vice-president and two trustees. The punishment may extend to expulsion and forfeiture of the school privileges, without a release from the payment of fees. But a student may appeal from such decision to the board of trustees.

"This instrument, or a copy of it, is to be read to each student before he becomes a member of the school; and he is to be made to understand that his matriculation is to be considered as an assent to these regulations.

"STEPHEN VAN RENSSELAER.

"ALBANY, Nov. 5, 1824."

This document shows the aim of the founder of the Rensselaer School to have been substantially that of the originator of the Royal Institution, though the methods pursued in attaining the object sought were different. He was doubtless familiar with the work and writings of Rumford, and it will be noticed that he has used in his description of the purpose of the school the same expression found in the London prospectus of 1799—"the application

of science to the common purposes of life."* Attention will be given later to the peculiar methods of instruction outlined in this letter, and before proceeding with the history of the school a short account will be given of the lives of its founder and of another to whose talent as a teacher and scientific investigator the success of the school was largely due.

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* See the address of President James Forsyth in Proceedings of the Semi-Centennial Celebration of the Rensselaer Polytechnic Institute, 1874.

CHAPTER II

STEPHEN VAN RENSSELAER AND AMOS EATON

Stephen Van Rensselaer was the fifth in direct line of descent from Killian Van Rensselaer, a merchant of Holland, who obtained by purchase from the Indians, about the year 1637, a district about twenty-four miles in breadth by forty-eight in length, comprising the territory which has since become the counties of Albany, Columbia, and Rensselaer, in the State of New York. He named it the Colony and Manor of Rensselaerwyck, and was its first Patroon. Stephen was born November 1, 1764, in the city of New York. His father was Stephen Van Rensselaer, the seventh Proprietor or Patroon of Rensselaerwyck, and his mother was Catharine, the daughter of Philip Livingston. Upon the death of his father in 1769, the care of the estate, which fell exclusively to him by the law of primogeniture, devolved upon his uncle, General Ten Broeck, who also acted as guardian during his minority. He was at first sent to a school in Albany and afterwards to one in Elizabethtown, New Jersey. At the beginning of the Revolution he was removed to Kingston, N. Y., and acquired the elements of a classical education at the Kingston Academy. He was later sent to Princeton College, but in consequence of its prox-

imity to the seat of war, it was thought advisable to send him to Harvard College, where he was graduated as a Bachelor of Arts in 1782, in the nineteenth year of his age. Returning to Albany he married, in 1783, a daughter of General Philip Schuyler, and upon reaching his majority settled down in the Manor House and took charge of his estates. By offering leases for long terms at a very moderate rent, he succeeded in bringing a large portion of his land into cultivation, but little of which had, until then, been converted into farms, and thus secured for himself a competent income.

He was made a major of infantry in 1786, and when, in 1801, Governor Jay formed the cavalry of the State into a separate corps he was placed in command with a commission of major-general of cavalry. He was elected, as a federalist, to the Assembly of the State in 1789, and the next year became a State senator, which position he held until 1795, when he was chosen lieutenant-governor at the same time that John Jay was elected governor. He was lieutenant-governor for six years, and was nominated for governor in 1801, but was defeated by De Witt Clinton. In the same year he was a member of the constitutional convention, and presided over it during the greater part of its deliberations. He was again elected to the Assembly in 1807, and when, during this term, a project was agitated to appoint a commission for exploring a route for a western canal, he was strongly in favor of it. Having been appointed, in 1810, to serve on this commission, he, in company with the

other members, made an exploration of the route for a canal from the Hudson River to Lake Erie.

When war with Great Britain was declared in 1812, he was given the command of the State militia, and on the 13th of October of that year assaulted and took the Heights of Queenstown, Canada, from which, however, he was compelled to withdraw by the refusal of the State militia, under the plea of constitutional scruples, to leave the State. His services in the field ended with this campaign, and in 1813 he was again nominated for governor, but was defeated by a small majority. In the meantime, the canal commission had continued its existence, and in 1816, when the Legislature directed the construction of the Erie Canal and committed the execution of the work to a board of canal commissioners, he was made a member of that body, and was its president from April, 1824, until his death. He was again elected a member of Assembly in 1816, in 1819 became a Regent of the State University, of which he was chancellor from 1835 until his death, and was a member of the constitutional convention of 1821.

From his position as Patroon and because of the great extent of territory he possessed, as well as on account of his great intelligence and the benevolence of his nature, Stephen Van Rensselaer had always been strongly in favor of the encouragement of farmers and the improvement of agriculture. When, therefore, in 1819, an act for the encouragement of agriculture was passed by the Legislature of the State, under the provisions of

which delegates from county societies formed a Central Board of Agriculture, he was elected its president at the first meeting in Albany, in January, 1820. Although the life of the board was brief, it was long enough to permit a geological and agricultural survey of the counties of Albany and Rensselaer to be made under its direction, though at the expense of its president. This survey was executed by Prof. Amos Eaton with the aid of two assistants, and was the first attempt made in this country to collect and arrange geological facts with a direct view to the improvement of agriculture. Analyses of soils were included, as well as a consideration of the proper methods of culture adapted to them, and the results were published in three volumes of Transactions and Memoirs. Imbued with strong opinions as to the value of such scientific investigations, when the board ceased to exist Stephen Van Rensselaer was unwilling to discontinue work of this character, and in the years 1822 and 1823 he caused to be made, at his own expense, under the direction of Professor Eaton, a geological survey extending from Boston to Lake Erie, a distance of about five hundred and fifty miles. It embraced a belt fifty miles in width, which covered, in this State, the line of the Erie Canal.

The intelligence and benevolence of the subject of this sketch were now, when he had reached the age of sixty years, to be directed into a new channel. He had long been interested in the instruction of the poorer families of his tenantry, and had reached

the conclusion that the most valuable education to be given the masses engaged in the ordinary occupations of life was one which would enable them to apply the principles of science to the "business of living." His first step in this direction was to secure the services of Professor Eaton, with whose qualifications he was thoroughly familiar. He employed him, in the summer of 1824, to traverse the State on or near the line of the Erie Canal, provided with sufficient apparatus and specimens to deliver, in all the principal towns where an audience of business men or others could be collected, a series of lectures, accompanied with experiments and illustrations, on "chemistry, natural philosophy, and some or all the branches of natural history." This undertaking was entirely successful. Encouraged by it, he determined to establish an institution one of the principal objects of which should be "to qualify teachers for instructing the sons and daughters of farmers and mechanics, by lectures or otherwise, in the application of experimental chemistry, philosophy and natural history to agriculture, domestic economy, the arts, and manufactures"; and there resulted the foundation at Troy, N. Y., in 1824, of the school which is the subject of this historical sketch. He at first intended to sustain the school for three years only, expecting that, if at the end of this period it were successful, the public would maintain it. Besides the expense of its original establishment he bore, however, until his death fourteen years later, about one-half the cost of its maintenance. As will be

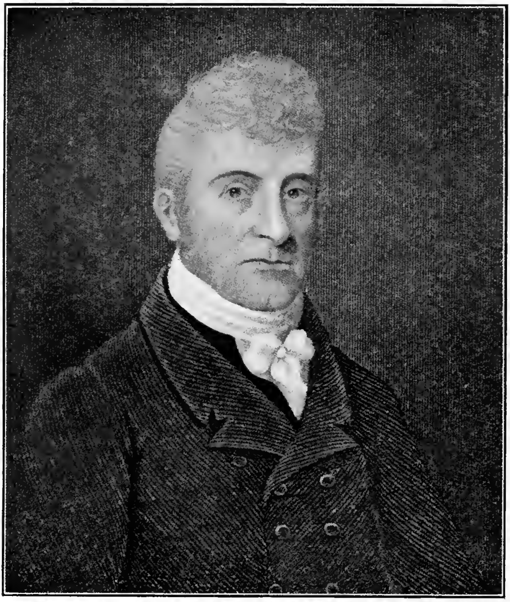
seen hereafter, the course of instruction was considerably enlarged, during his life and with his approval, to meet the growing demand for educated engineers and scientific men.

In the meantime, in 1823, General Van Rensselaer had been elected to Congress as a Representative from Albany county, and some of his instructions in relation to the new school were forwarded from Washington. He continued in Congress for six years, and was during this period chairman of the Committee on Agriculture. During a part of his active public life, from 1793 until his resignation in 1819, he was a trustee of Williams College. In 1825 the degree LL.D. was conferred on him by Yale College. He died at the old Manor House in Albany on the twenty-sixth day of January, 1839.*

Although distinguished because of his position and character, and on account of many years of successful public service in important positions, the memory of Stephen Van Rensselaer will be perpetuated chiefly by means of the school which he established for the benefit of his fellow-men.

In an article on the Institute, one of an interesting series on the engineering schools of the United States, written in 1892 for *Engineering News* by A. M. Wellington, he says: "The founder was not of the class of rich men who found colleges only from a vague philanthropic instinct and to per-

* See "A Discourse on the Life, Services and Character of Stephen Van Rensselaer," by Daniel G. Barnard, Albany, 1839.



S. Van Rensselaer

Amos Eaton

petuate his name. He had distinct and very original and decided views as to proper methods of instruction, which he took great pains to provide for and enforce at length. His love of thoroughness, his determination that the instruction should be of the best, if there was any, and that the school should take a high rank among the kindred institutions of the world, crop out constantly in his letters and deed of foundation. . . . He was no common founder, and he founded no common school. The cause of engineering education owed much to him indeed."

It will be noticed in the account just given of his life that in all his efforts for the advancement of scientific knowledge, whether by agricultural and geological surveys or by the more direct method of instruction, he employed one individual as his agent. That no error was made in the choice is proved by the uniform success of his endeavors.

Amos Eaton was indeed no ordinary man. The history of the last seventeen years of his life is identical with that of the Rensselaer Institute. The importance of his work, however, not only in the early development of the school but as a scientific investigator and author of works on the natural sciences, renders it advisable to give, in this connection, a sketch of his earlier history. He was a native of Chatham, N. Y., and was born May 17, 1776. His father, Abel Eaton, was a farmer in comfortable circumstances. He early manifested superior abilities, and was selected to deliver an

oration on the Fourth of July, 1790, when but fourteen years of age. About this time, having acted as chainman during a land survey, he determined to become a surveyor. Not having the requisite instruments, he interested a skilful blacksmith in his behalf, who agreed to work for him at night if he would "blow and strike" by day. A needle and a good working chain were the result of several weeks' work. This circumstance in his life doubtless gave rise to the remark, found in *Silliman's Journal*, that "in 1791 he was an apprenticed blacksmith." The bottom of an old pewter plate, well smoothed, polished and graduated, served as a compass-circle, so that Eaton, when sixteen years old, was in the field with his home-made instruments, doing occasional surveying in the neighborhood. He aspired, however, to higher attainments and, encouraged by his parents, was fitted for college at Spencertown, N. Y., and was graduated at Williams College, in 1799, with a high reputation for scientific knowledge. In the same year he began the study of law at Spencertown, and subsequently continued his studies in New York.

At this time he first became interested in the study of botany and other natural sciences. While in New York, in 1802, he borrowed Kirwan's "Mineralogy," then a scarce book, and made a manuscript copy of the entire work. He was admitted to the bar, at Albany, in 1802, and soon after established himself as a lawyer and land agent in Catskill, N. Y. Here he remained several years,

his position affording him excellent opportunities for cultivating his growing taste for the natural sciences. In May, 1810, he made in Catskill, it is believed, the first attempt in this country at a popular course of lectures on botany, compiling for the use of his class a small elementary treatise. For this Dr. Hosack, who had formerly taught him in New York, complimented him as being the "first in the field."

Having found his love for the details of his profession diminishing and his interest in the natural sciences increasing, he finally resolved to abandon the practice of law and to fit himself more thoroughly for scientific pursuits. With this end in view he went to New Haven, in 1815, to avail himself of the advantages found at Yale College. He placed himself under the instruction of Professor Silliman, who threw open to him his lectures on chemistry, geology and mineralogy, as well as his own library and the cabinet of minerals of that institution. Here, also, he found a good botanist in Dr. Eli Ives, Professor of Botany and Materia Medica in the medical department of the college, who had accumulated a good library, to which he gave Eaton free access. With these advantages and his already advanced acquirements he was soon well qualified as an explorer and teacher. Returning to Williamstown in 1817, he gave courses of lectures in botany, mineralogy and geology to volunteer classes of students. His influence in the college was remarkable, and he awakened there an interest in the natural sciences which has never

died out. His pupils published, in 1817, the first edition of his "Manual of Botany," a 12mo of 164 pages, which, as the late Dr. Lewis C. Beck wrote in 1852, "gave an impulse to the study of botany in New England and New York, as the only descriptive work which was then current was that of Pursh, an expensive one with Latin descriptions." This work was improved by repeated revisions and additions, and became, in the eighth edition, published in 1840, a large octavo volume of 625 pages, which was entitled "North American Botany," and contained a description of 5,267 species of plants.

The encouragement received by Mr. Eaton at Williams College determined him to give courses of popular scientific lectures, accompanied with practical instructions, to such classes as he might be able to organize in several of the larger towns of New England and New York. These met with great success, and in the course of two or three years he diffused a great amount of scientific knowledge, and there sprang up as the result of his labors an army of young botanists and geologists. According to Prof. Albert Hopkins, of Williams College, he was one of the first to popularize science in the Northern States, and was one of the first in this country to study nature in the field, with his classes.

In 1818, in compliance with a special invitation from Governor DeWitt Clinton, he went to Albany and delivered a course of lectures before the members of the Legislature. Here he became ac-

quainted with many of the leading men of the State, interesting them especially in geology and its application, by means of surveys, to agriculture. A train of causes was thus set in operation which resulted in giving to the world that great work, "The Natural History of New York," so creditable to the State and to the scientific men who executed it, of whom several had been Professor Eaton's pupils. In this year he published the first edition of his "Index to the Geology of the Northern States," which was the first attempt at a general arrangement of the geological strata in North America. In his "Education in the United States," Boone says: "Among the older geologists, and one of the first to study nature in the field, was Prof. Amos Eaton of Williams College. He has been called the 'Father of American Geology,' was the instructor of Hall, Dana and Williams, and initiated the interest in a half dozen States."

He afterwards delivered several courses of lectures in the medical college at Castleton, Vt., in which he was appointed Professor of Natural History in 1820. In this year and the following one he made the geological and agricultural surveys of Albany and Rensselaer counties to which reference has been made in the sketch of the life of Stephen Van Rensselaer. Of these surveys Professor Silliman remarked, in his Journal, "The attempt is novel in this country"; adding, "We are not aware of any attempt on so extensive and systematic a scale, to make them subservient to the important interests of agriculture." There has also been

previously mentioned the geological survey of the district adjoining the Erie Canal, made by Professor Eaton in 1822 and 1823. A report of this survey, consisting of 160 octavo pages, with a profile section of rock formations from the Atlantic Ocean, across the States of Massachusetts and New York, to Lake Erie, was published in 1824. In relation to this work Governor Seward, in his introduction to the "Natural History of the State of New York," said: "This publication marked an era in the progress of geology in this country. It is in some respects inaccurate, but it must be remembered that its talented and indefatigable author was without a guide in exploring the older formations, and that he described rocks which no geologist had, at that time, attempted to classify. Rocks were then classified chiefly by their mineralogical characters, and the aid which the science has since learned to derive from fossils, in determining the chronology and classification of rocks, was scarcely known here and had only just begun to be appreciated in Europe. We are indebted, nevertheless, to Professor Eaton for the commencement of that independence of European classification which has been found indispensable in describing the New York system." He also said: "Professor Eaton enumerated nearly all the rocks in western New York, in their order of succession; and his enumeration has, with one or two exceptions, proved correct. It is a matter of surprise that he recognized, at so early a period, the old red sandstone on the Catskill mountains. a

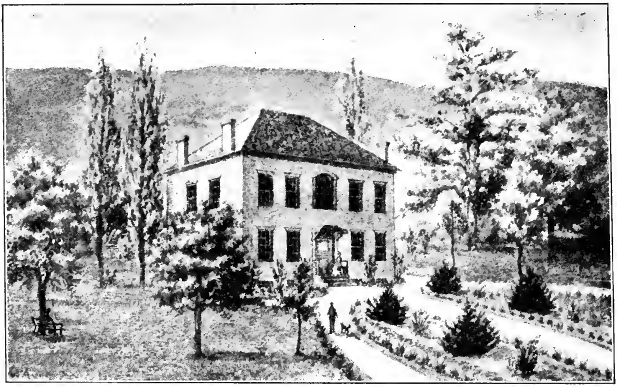
discovery the reality of which has since been proved by fossil tests."

Such was the man chosen by Stephen Van Rensselaer to take charge, as Senior Professor and Agent, of the institution which he established in 1824. Eaton's enthusiasm and remarkable powers as a teacher doubtless had their influence in determining him to bear the expense of the series of lectures in towns along the Erie Canal, and afterwards to undertake the creation of the school. And it does not detract from the credit of the founder to say that the methods and the object of the institution, as set forth in his letter to Dr. Blatchford, were, if not wholly, at least partly due to its first Senior Professor.

Rev. Calvin Durfee in his History of Williams College (1860), from which most of this account of the life of Eaton is taken, says: "In this school Professor Eaton was able to perfect and carry out, to a high degree of success, his favorite plan of teaching classes by making his pupils experimenters and workers in every department of science where it was practicable; substituting also lectures by the pupils to each other in place of the usual system of recitations. This method of giving instruction and of preparing young men to become successful teachers has here succeeded most admirably, and has been, in some of its features, introduced into other schools of science." And again: "The history of natural science on this continent can never be faithfully written, without giving the name of Amos Eaton an honorable place. It was

he, more than any other individual in the United States, who, finding the natural sciences in the hands of the learned few, by means of his popular lectures, simplified text-books and practical instructions, threw them broadcast to the many. He aimed at a general diffusion of the natural sciences, and nobly and successfully did he accomplish his mission."

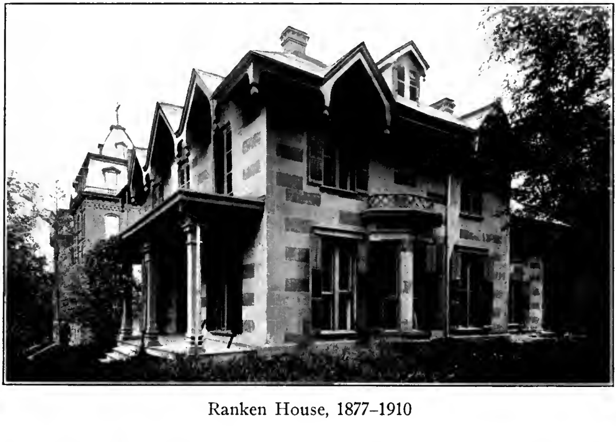
The last seventeen years of his life were passed in Troy as Senior Professor in the Rensselaer School or Rensselaer Institute, the name by which it was afterwards known. In the minutes of the Board of Trustees we find this tribute to his memory: "The trustees are called to the painful duty of recording the death of Prof. Amos Eaton, who has long been at the head of the Rensselaer Institute. He died on the tenth day of May, 1842, in the sixty-sixth year of his age. It is but simple justice to say that Professor Eaton was, under its distinguished patron and benefactor, the founder of this school of the natural sciences; that he was a faithful and successful instructor in these studies, and that he contributed, by his labors in the Institute and by his geological survey of the State of New York, more than any other man in our country to the cultivation of geological science. While the trustees consider the experiment, as to the mode of communicating knowledge adopted in the Rensselaer Institute, as a successful one, they are fully persuaded that much of this success is due to the industry and enthusiasm of Professor Eaton. Few men were ever more devoted to the peculiar duties



Van der Heyden Mansion, 1834–41

Building on the Infant School Lot, 1844–62

Main Building, 1864–1904



Ranken House, 1877–1910

of his profession than he, and his perseverance was equal to his devotedness. His removal may be considered not only as a loss to our city, but to our country."

An idea of his labors as an author and investigator may be obtained from a list of his works. He published an Elementary Treatise on Botany, 1810; Manual of Botany, 1817; Botanical Dictionary, 1817; Botanical Exercises, 1820; Botanical Grammar and Dictionary, 1828; Chemical Note Book, 1821; Chemical Instructor, 1822; Zoological Syllabus and Note Book, 1822; Cuvier's Grand Division, 1822; Art Without Science, 1800; Philosophical Instructor, 1824; Directions for Surveying and Engineering, 1838; Index to the Geology of the Northern States, 1818; Geological and Agricultural Survey of the County of Albany, N. Y., 1820; Geological and Agricultural Survey of Rensselaer County, 1822; Geological Nomenclature of North America, 1822; Geological and Agricultural Survey of the District adjoining the Erie Canal, 1824; Geological Text Book, prepared for popular lectures on North American geology, 1830; Geological Note Book for Troy Class, 1841. Of most of these works a number of different editions were published.

In after years his memory as a botanist was honored by Professor Gray, who named for him two species of plants, the *Eatonia obtusata* and *Eatonia Pennsylvanica*.

Enough has been said to show the great value of his original work in the natural sciences, and this

short sketch of his life will be closed by a tribute to his memory as a teacher, paid, thirty years after his death, by one of his former pupils. At the ceremonies attending the erection of a monument to him, during the celebration of the semi-centennial of the Rensselaer Polytechnic Institute, in 1874, Prof. James Hall, of the class of 1832, New York State Geologist and Palæontologist, himself with a world-wide fame in his specialty, said, in part: "In the progress of civilization it is not the slow, uniform motion of the great masses that helps it forward, but the few men who come out from them and strike a new key. Professor Eaton taught us the manipulations in science with the simplest materials, so that a student could go into the forest and construct a pneumatic trough, or a balance, and perform there his experiments in chemistry or physics. To his memory we owe much. His name has been neglected before the public, but cherished in the bosoms of those who knew him—a man capable of interesting young men, having a brain one-fourth larger than that of the mass of mankind, and that brain devoted to the service of science. If we with great means do what he did with small, we shall deserve well of coming generations."

CHAPTER III

ACT OF INCORPORATION AND EARLY BY-LAWS

Shortly after the receipt of Stephen Van Rensselaer's letter, given in the first chapter, the Rev. Dr. Blatchford called together the Board of Trustees of the new school. The first meeting was held December 29, 1824, and the institution was then named the "Rensselaer School." An outline of the method of instruction to be pursued may be gathered from the minutes of the proceedings of this meeting, during which it was:

"*Resolved,* That persons attending the courses of instruction at Rensselaer School be distributed into three classes, viz.: a Day Class, an Afternoon Class and an Evening Class.

"The exercises of the Day Class, for six hours in each day, except Sunday, shall consist of experiments in chemistry, performed by themselves, and in giving explanations, or the *rationale* of the experiments; and they shall undergo daily examinations and alternately become examiners themselves. Each member of this class shall pay $25 a term (as prescribed by the founder in the orders promulgated by him), and at the end of each term shall be examined for his certificate.

"The Afternoon Class shall consist of those who may have previously attended one or more courses of lectures on chemistry at some public institution.

They will hear no afternoon lectures; but their exercises will consist of a course of experiments in chemistry, performed by themselves, as above, with the *rationale*, conducted under the superintendence of the senior professor. These exercises will occupy three hours in the afternoon of each week-day except Saturday. Each member of this class shall pay $10 a term, and at the end of each term undergo an examination for his certificate.

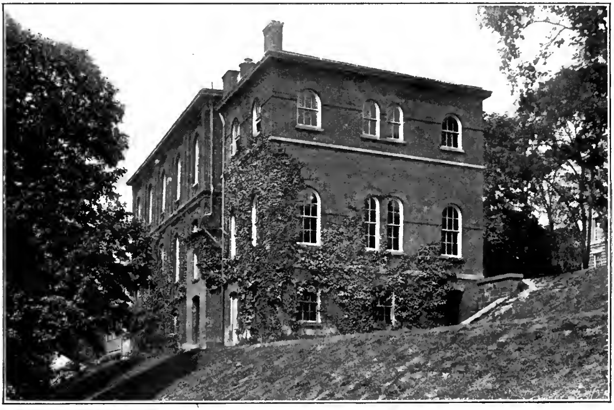
"The Evening Class will attend lectures, on three evenings of each week, for ten weeks. This course of lectures will embrace chemistry, experimental philosophy, and the outlines of mineralogy, geology, botany, and zoology. The charge for attendance will be $5. Members of this class will not be examined at the end of the term, but may have certificates of attendance." *

The opening of the school on Monday, January 3, 1825, was announced by a notice, signed by the president, printed in the Troy *Sentinel* of December 28th. The announcement reads, in part, as follows:

"The Hon. Stephen Van Rensselaer having established a school near the northern limits of Troy for teaching the physical sciences with their application to the arts of life; having appointed Profs. A. Eaton and L. C. Beck to give courses of instruction particularly calculated to prepare operative chemists and practical naturalists, properly qualified to act as teachers in villages and school dis-

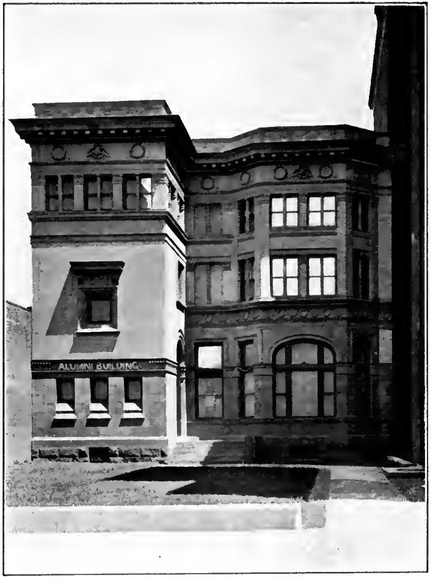
* Troy *Sentinel*, January 4, 1825.

Winslow Chemical Laboratory, 1866–1902



Winslow Laboratory, 1902–06; Shop, 1907–

Old Gymnasium, 1887–1913



Alumni Building, 1892–1912

tricts; having appointed an agent and furnished him with funds for procuring apparatus and fitting up a laboratory, library-room, etc.; and the agent having given notice to the president of the institution that the requisite collections and preparations are completed, it seems proper to give public notice of these circumstances.

"Accordingly the public is respectfully notified that everything is in readiness at the Rensselaer School for giving instruction in chemistry, experimental philosophy and natural history, with their application to agriculture, domestic economy, and the arts; and also for teaching land surveying. . . .

"During the day no lectures will be given by the professors, but under their superintendence the students, divided into sections, will perform all the experiments and give the explanations, the students thus acting as lecturers and the professors as auditors. . . .

"Students who wish for *extra* accommodations will pay from $1.75 to $2.00 a week for board and lodging. But any number of students can have good plain board and lodging near the school for $1.50 a week."

The courses and methods thus set forth are seen to be those outlined in the letter of the founder, with the orders accompanying it; and the trustees, instructors, and other officers were the persons named by him in the same document. Being at this time a member of Congress, Mr. Van Rensselaer wrote from Washington another letter to Dr. Blatchford, dated February 11, 1825, in which a

draft of by-laws for the further government of the institution was enclosed:

"WASHINGTON, February 11, 1825.

"*Dear Sir:* I offer my acknowledgements for the interest you have taken in promoting the school over which you preside. I have enclosed a draft, hastily drawn up, of by-laws, for the government of the school, which I beg to submit to yourself and the gentlemen associated with you for consideration and amendment. I flatter myself that the school will succeed and that the advantages I anticipated will be realized.

"With respect, yours sincerely,

"S. V. RENSSELAER."

[ENCLOSED DRAFT]

"1. That there be two terms in each year, of twelve or fifteen weeks each, to be called the summer term and winter. The summer term to commence in May, the winter term to commence in January—say, the last of May and January.

"2. That during the summer terms the students shall be taught the elementary principles of the science of chemistry, experimental philosophy, natural history, land surveying, etc., with their application to agriculture, manufactures, and the arts.

"3. That, with the consent of the proprietors, a number of well-cultivated farms and workshops in the vicinity of the school be entered on the records of the school as places of scholastic exercise for students, where the application of the sciences may be most conveniently taught.

"4. That during the winter term students be exercised in giving lectures, by turns, on all the branches taught in the summer term, under the direction of the professors or their assistants, in order to qualify them for giving instruction in these branches. And that a course of evening lectures be given in the winter term, by the professors, so as to embrace elementary views of the whole course of instruction given at the school.

"5. That an annual commencement be held in April at the close of the winter term, for conferring diplomas on those qualified."

This letter, and the previous one from Mr. Van Rensselaer dated November 5, 1824, are important documents in the history of the School. They, with the draft enclosed with the last one, were adopted as its constitution at a meeting of the Board of Trustees held at the Old Bank Place, March 11, 1825.*

After about fourteen months of successful trial the school was incorporated by the following act, passed March 21, 1826:

AN ACT TO INCORPORATE THE RENSSELAER SCHOOL †

Whereas, the honorable Stephen Van Rensselaer has procured suitable buildings in the city of Troy, in Rensselaer county, and therein set up a school, and at his own

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* The Constitution and Laws of Rensselaer School in Troy, New York. Adopted by the Board of Trustees, March 11, 1825. Printed by Tuttle and Richards, 1825. The By-Laws were also printed in this pamphlet together with a description of the library, apparatus and natural history specimens and an estimate of the cost of board and lodging for the students.

† Laws of the State of New York, 1826, Chap. 83.

private expense has furnished the same with a scientific library, chemical and philosophical; instruments for teaching land surveying and other branches of practical mathematics, which are useful to the agriculturist, the machinist, and to other artists, has caused to be prepared and furnished separate and commodious rooms for instruction in natural philosophy, natural history, the common operations in chemistry, and an assay-room for the analysis of soils, manures, mineral and animal and vegetable matter, with the application of these departments of science to agriculture, domestic economy, and the arts: *And whereas*, said Van Rensselaer has employed teachers, and caused an experimental system of instruction to be adopted by them, whereby each student is required to observe the operations of a select number of agriculturists and artists in the vicinity of said school, and to demonstrate the principles upon which the results of such operations depend, by experiments and specimens performed and exhibited by his own hands, under the direction of said teachers: *And whereas*, one important object of said school is to qualify teachers for instructing youths in villages and in common-school districts, belonging to the class of farmers and mechanics, by lectures or otherwise, in the application of the most important principles of experimental chemistry, natural philosophy, natural history, and practical mathematics to agriculture, domestic economy, the arts, and manufactures: *And whereas*, the trustees of said school, who were appointed to take charge thereof, by said Van Rensselaer, by an instrument in writing dated November the fifth, in the year eighteen hundred and twenty-four, have represented to this Legislature, that after having tested the plan of said school by a trial of one year, they find it to be practicable and in their opinion highly beneficial to the public: *And whereas*, the Legislature considers it to be their duty to encourage such laudable efforts and such munificent applications of surplus wealth of individuals: Therefore

1. *BE it enacted by the People of the State of New York, represented in Senate and Assembly,* That Simeon De Witt, Samuel Blatchford, John D. Dickinson, Guert Van Schoonhoven, Elias Parmalee, Richard P. Hart, John Cramer and Theodore Romeyn Beck, shall be and hereby are constituted a body corporate and politic, by the name of "the president and trustees of Rensselaer School," and by that name they shall have perpetual succession, and shall be capable of suing and being sued, pleading and being impleaded, answering and being answered unto, defending and being defended, in all courts and suits whatsoever; and may have a common seal, with power to change or alter the same from time to time, and shall be capable of purchasing, taking possession of, holding and enjoying to them and their successors any real estate, in fee simple or otherwise, and any goods, chattels, and personal estate, and of selling, leasing, or otherwise disposing of the said real and personal estate, or of any part thereof, at their will and pleasure. *Provided, however,* That the funds of said corporation shall be used for and appropriated to the objects contemplated in the preamble of this act; *And provided also,* That the clear annual income of such real and personal estate shall not exceed the sum of twenty thousand dollars.

2. *And be it further enacted,* That the said trustees shall, from time to time, forever hereafter have power to make, constitute, ordain, and establish such by-laws and regulations as they shall judge proper, for the election of the officers and prescribing their respective functions, for the government of the officers and students of said school as to their respective duties, for collecting fines, impositions, and term fees, for suspending, expelling, and otherwise punishing students, so that it shall not extend further than expulsion and retaining term fees, and collecting the amount of any damage done by students to the property of said school; for conferring on students such honors as they may judge proper, having relation to the object of said school as expressed in the said preamble, and for

managing and directing all the concerns of said school; also for confirming the constitution and by-laws, or any part thereof heretofore adopted by said trustees, provided such by-laws and regulations have relation to the subjects of the preamble of this act exclusively.

3. *And be it further enacted,* That the officers of said school shall consist of a president, two vice-presidents, a treasurer and secretary, two professors, and such a number of adjunct professors and assistants as the trustees may from time to time appoint or authorize the appointment of, a librarian, monitor and steward. That whenever any vacancy shall happen among the trustees of said school, such vacancy or vacancies may be filled by a quorum of the remaining trustees, so that two trustees shall reside in Albany, two in Troy, two in Lansingburgh, and two in Waterford.

4. *And be it further enacted,* That there shall be one annual meeting of the trustees of said school on the last Wednesday in April, at which meeting four members of the board of trustees shall constitute a quorum, and that four members shall also constitute a quorum at all special meetings, to be called by the president at any time after the passing of this act, provided a written notice of such meeting, signed by the president or by one of the vice-presidents, shall be left at the dwelling-house or place of residence of such member of the board seven days previous to such special meeting.

5. *And be it further enacted,* That Samuel Blatchford shall be president, and that he, together with all the other officers of the said school, shall remain as heretofore, until a special meeting of a quorum of said trustees shall be assembled at such school, by the president, or by a vice-president, as prescribed in the fourth section of this act or until the annual meeting on the last Wednesday in April next, then to be permitted to continue in their respective offices, or their places to be filled at the pleasure of the trustees.

6. *And be it further enacted,* That the Legislature may at any time modify or repeal this act.

Upon the passage of the act of incorporation the trustees named therein held a meeting at the school on April 3, 1826, and, after reappointing all the officers who had been serving at the time the bill was passed, they resolved that the constitution previously adopted, consisting of the two letters of Mr. Van Rensselaer, should continue to be the constitution of the school, with certain amendments. These amendments provided that there should be three terms in each year, to be called the Fall Term, Winter Term, and Spring Term; that the fall term should be an experimental term commencing on the third Wednesday in July and continuing fifteen weeks; that the winter term should be a recitation term commencing on the third Wednesday in November and continuing twelve weeks; that the spring term should be an experimental term commencing on the first Wednesday in March and continuing until the last Wednesday in June, and that the last mentioned day should be the Annual Commencement.

At the same meeting a code of by-laws consisting of eleven articles was passed. These replaced the fourteen by-laws, passed March 11, 1825, which are referred to in the new code as "having been intended for the temporary government of the school in its incipient state." Some of these articles which embody the curriculum of that day will be given in full.

"Article 1. The course of exercise at said school

in the Fall Term shall be, as nearly as circumstances will permit, as follows: Each student shall give five lectures each week on systematic botany, demonstrated with specimens, for the first three weeks, and shall either collect, analyze and preserve specimens of plants, or examine the operations of artists and manufacturers at the school workshops, under the direction of a professor or assistant, who shall explain the scientific principles upon which such operations depend, four hours on each of six days in every week, unless excused by a professor on account of the weather, ill-health or other sufficient cause. For the remaining twelve weeks, each student shall give fifteen lectures on mineralogy and zoology, demonstrated with specimens; fifteen lectures on chemical powers and substances not metallic; fifteen lectures on natural philosophy, including astronomy; and fifteen lectures on metalloids, metals, soils, manures, mineral waters, and animal and vegetable matter—all to be fully illustrated with experiments performed with his own hands; and shall examine the operations of artists at the school workshops, under the direction of a professor or assistant, four hours on every Saturday, unless excused as aforesaid.

"Article 2. During the Winter Term students shall recite, to a professor or to a competent assistant, the elements of the sciences taught in the fall and spring terms; and shall study and recite, as auxiliary branches in aid of these sciences, rhetoric, logic, geography, and as much mathematics as the faculty shall deem necessary for studying land sur-

veying, common mensuration, and for performing the common astronomical calculations.

"Article 3. The course of exercises in the Spring Term shall be, as nearly as circumstances will admit, as follows: Each student shall, during the first six weeks, give ten lectures on experimental philosophy; ten lectures on chemical powers and on substances not metallic; and ten lectures on metalloids, metals, soils and mineral waters. For the remainder of the term each student shall be exercised in the application of the sciences before enumerated to the analysis of particular selected specimens of soils, manures, animal and vegetable substances, ores, and mineral waters; and shall devote four hours of each day, unless excused by one of the faculty, to the examination of the operations of the agriculturists on the school farms, together with the progress of cultivated grains, grasses, fruit-trees, and other plants, to practical land-surveying and general mensuration, to calculations upon the application of water-power and steam which is made to the various machines in the vicinity of the school, and to an examination of the laws of hydrostatics and hydrodynamics which are exemplified by the locks, canals, aqueducts, and natural waterfalls surrounding the institution."

Article 4 relates to the admission of students. It provides that no candidate shall be admitted as an annual student under the age of seventeen years. The conditions under which examinations are to be held and degrees given are set forth in Article 5. The degree conferred was Bachelor of Arts in Rens-

selaer School, A.B. (r.s.). After the expiration of three years from the receipt of this degree, or of one year, if the student attended a second annual course at the school and proved his capacity, the degree Master of Arts in Rensselaer School, M.A. (r.s.), was conferred. No degree could be conferred on any one less than eighteen years old; and in using the abbreviation for Bachelor or Master of Arts the letters (r.s.) had to be added. It is provided in Article 6 that, after receiving a degree, a person ever after remained a member of the school, and must, every three years, report his occupation to the trustees. We learn from Article 7 that at this time the tuition was $15 for each experimental term and $6 for the recitation term. The student also had to pay extra for breakage and chemicals consumed and his proportion of the cost of fuel and lights and the services of the monitors. Article 8 relates to weekly reports from professors, Article 9 to the times of meeting of the board of trustees, Article 10 makes void all previous rules and by-laws, and Article 11 provides for temporary rules to be made by the faculty.

Much of the information above given in relation to the founding of the school is taken from the original minutes of the meetings held by the board of trustees and from a pamphlet entitled "Constitution and Laws of Rensselaer School in Troy, New York; adopted by the board of trustees April 3, 1826; together with a Catalogue of Officers and Students," which was published in Albany in 1826. Among "Notices and Remarks" found in

it, there is a paragraph containing an itemized account of the necessary expenses of a student. This will be quoted to show the difference between the cost of education at that time and the outlay required at the present day: "The expenses for a student of ordinary prudence will be about $100, if he is absent during the winter term:

Board, 30 weeks at $1.50	$45.00
Washing, about 18 cents per week ..	5.62
Chemical substances, etc., about	4.00
Proportion of fuel and lights, about ..	6.00
Text-books, about	4.00
Experimental term fees, $15	30.00
Total	$94.62"

The catalogue contains the names of the professors and twenty-five students. Amos Eaton is entitled professor of chemistry and natural philosophy and lecturer on geology, land surveying, etc., and Lewis C. Beck, professor of botany, mineralogy and zoology. Eighteen of the students came from the State of New York, two from New Hampshire, two from Massachusetts, one from Vermont, one from Ohio and one from Pennsylvania.

CHAPTER IV

METHODS OF INSTRUCTION—PREPARATION BRANCH ESTABLISHED

ALTHOUGH a general knowledge of the mode of instruction pursued at the Rensselaer School may be obtained from the letters of the founder and especially from the by-laws adopted by the board of trustees at the early meetings, the novelty of the system of teaching and the fact that the institution was established at such an early date render advisable a more detailed account of its methods at that time. The peculiarities of the school are described in several of the pamphlets published, under the auspices of the board of trustees, during the first years of its existence. Its three distinct characteristics will be given in the words of one of these publications.

"1. The most distinctive character in the plan of the school consists in giving the pupil the place of teacher in all his exercises. From schools or colleges where the highest branches are taught to the common village schools, the teacher always improves *himself* more than he does his *pupils*. Being under the necessity of relying upon his own resources and of making every subject his own, he becomes an adept as a matter of necessity. Taking advantage of this principle, students of Rens-

selaer School learn by giving experimental and demonstrative lectures, with experiments and specimens.

"2. In every branch of learning the student begins with its practical application, and is introduced to a knowledge of elementary principles, from time to time, as his progress requires. After visiting a bleaching-factory he returns to the laboratory and produces the chlorine gas and experiments upon it until he is familiar with all the elementary principles appertaining to that curious substance. After seeing the process of tanning he enters the laboratory with most ardent zeal for a knowledge of the principles upon which the tanner's operations depend. He can now apply the experiment for making an insoluble precipitate of tannin and animal gelatin, also the soapy compound of animal oil and alkaline earth, etc. After seeing buhr millstones consolidated by a gypsum cement, he is anxious to try the experiment of disengaging the water of combination in the gypsum, to observe the effect of reabsorption. By this method a strong desire to study an elementary principle is excited by bringing his labors to a point where he perceives the necessity of it and its direct application to a useful purpose.

"3. Corporal exercise is not only necessary for the health of students, but for qualifying them for the business of life. When such exercises are chosen by students they are not always judiciously selected. Such exercises as running, jumping, climbing, scuffling, and the like are calculated to

detract from that dignity of deportment which becomes a man of science. Therefore a system of exercises is adopted at this school which, while it improves the health, also improves the mind and excludes those vulgarisms which are too often rendered habitual among students. Such exercises as land surveying, general engineering, collecting and preserving specimens in botany, mineralogy and zoology, examining workshops and factories, watching the progress of agricultural operations, making experiments upon nutritious matters proper for vegetables in the experimental garden, etc., are made the duties of students for a stated number of hours on each day."

To further illustrate the methods employed an account will be given of the routine work during the three terms which composed the year. Each term was divided into sub-terms three weeks in duration. Students were admitted at the beginning of any sub-term and their annual course was completed at the end of a year from the time they commenced. The exercises were so arranged that it was a matter of indifference at which sub-term they began. The fall term opened on the third Wednesday in July. The first sub-term was devoted wholly to botany, and each student gave fifteen extemporaneous lectures on this subject before his fellow-students and one or more professors. At the end of the first sub-term the class was distributed into four divisions. The first division was placed in the natural history room for one sub-term, the second in the common laboratory,

the third in the natural philosophy room, and the fourth in the assay room.

The equipment of these laboratories, as first established, is interesting: "The natural history room is furnished with sufficient specimens for illustrating mineralogy, botany, and zoology, a large furnace, a goniometer, a megascope, a blowpipe, scales, tests, etc., sufficient for investigating subjects in natural history.

"The common laboratory is furnished with a cistern, furnace, and everything necessary for performing chemical experiments, excepting those which teach the analysis of metalloids, metals and animal and vegetable matter.

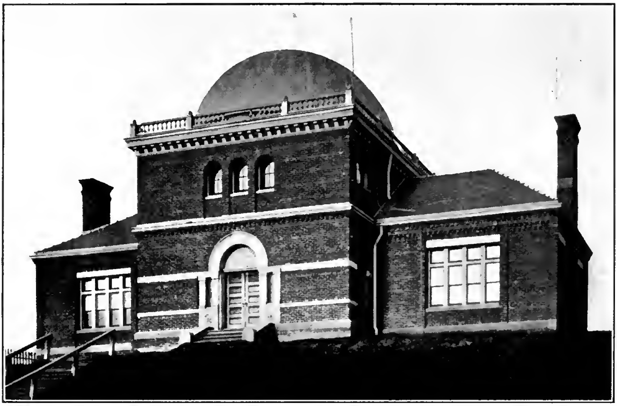
"The natural philosophy room is furnished with a small observatory, skylights, mechanical powers, hydraulic instruments, optical instruments, mathematical instruments, pneumatical apparatus, etc., sufficient for demonstrating every principle in experimental philosophy.

"The assay room is furnished with skylights, a forge, large bellows, and other conveniences for the analysis of minerals, mineral waters, and animal and vegetable matter."

Each of the four divisions was wholly employed with the subjects assigned to the room occupied by it during one sub-term. Then all the divisions moved on "in a circle." The first took the place of the second, the second that of the third, the third that of the fourth, and the fourth that of the first. At the beginning of the next sub-term all the divisions moved on in the circle again as before;

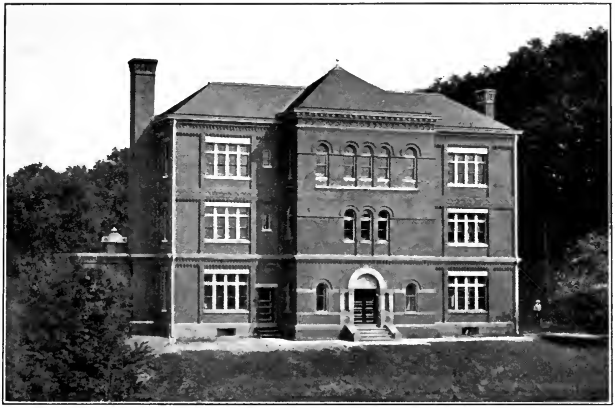
and so on, until each division had devoted a sub-term to each department.

There was a regular daily routine for the work. The first bell rang at sunrise and the second twenty minutes later. Five minutes after this the students gathered in the reading-room for an examination on the exercises of the preceding day. At nine o'clock a lecture was given by a professor to all of the students, and at ten o'clock the daily assistant, called the officer of the day, gave a lecture before all of them in the presence of the professor. The place of daily assistant was filled by the students in rotation. At the close of the lecture the students criticised his style, manner and experimental illustrations. Ten minutes after the close of this exercise, two sub-assistants gave lectures in separate rooms, each before two divisions, in the presence of a professor or assistant. Every one took notes, for use at the meeting held for purposes of general criticism at the close of the exercises of the forenoon. At the expiration of ten minutes from the end of these lectures the four divisions separated, each going to its respective department, where every student in turn lectured before the others and a professor or assistant. They then all met in the reading-room and each criticised all the lectures he had heard. These exercises closed at one o'clock. After dinner the divisions went to their respective departments to prepare for the experiments and demonstrations of the next day. After this preparation, which was generally completed by four o'clock, the stu-



Proudfit Observatory, 1878–1900

Proudfit Laboratory, 1900–03



Proudfit Laboratory, 1903–04

Proudfit Laboratory, 1904–

dents met in the reading-room to receive directions for the "afternoon amusements." They were then arranged in divisions and led by professors or assistants to workshops, factories, etc., "for the purpose of applying the principles of mechanical philosophy and chemistry to the various operations of artists," or to the field to collect plants. Five days of each week were occupied as above described. Every other Saturday, and also Friday and Saturday evenings, were devoted to parliamentary exercises. The students represented the different States and formed a parliament for purposes of debate. On the alternate Saturdays not devoted to debate, after the morning examinations were over, they were free for the rest of the day.

The exercises of the Winter term, which was twelve weeks in duration, were conducted on the same plan as that described for the Fall term. Rhetoric, logic, etymology, history, geography, and mathematics were taught. The afternoon amusements, adopted according to the state of the weather and without systematic order, were: use of the sextant, compass, goniometer, blowpipe, telescope, and other optical instruments, construction and use of ice lenses and prisms, map-drawing, and the dissection of animals.

The first six weeks of the Spring term were devoted to a review of the subjects of the Fall term, and the last nine weeks, or three sub-terms, were employed in the practical application of the work of the Fall term. Instruction was given in the

analysis of selected specimens of minerals, mineral waters, soils, manures, and animal and vegetable matter, animal and vegetable physiology, origin and nature of the nutritious substances necessary for the growth of plants, microscopic examination of the structure of organized substances, principles of astronomical calculations, with practical application to eclipses and matter found in the common almanac; taking latitude and longitude, lunar observations, etc. The afternoon amusements for the last nine weeks were: collecting and preserving plants, animals, and minerals; land surveying and levelling; calculating water pressure in locks, aqueducts, mill flumes, dams, raceways, penstocks, and pumps; applying the principles of "mechanical philosophy" to the machinery of steamboats, mills, factories, etc.; application of mathematics to cask and ship gauging and to other cases of practical mensuration; examination of the progress of agricultural and horticultural operations; application of active substances to plants in the experimental garden, such as the strong acids and alkalies, the various gases, free and combined, and the effects of the atmospheric gases where all other active agents are excluded.

Examinations were held at the end of each term; and at the annual examinations in June candidates for degrees gave lectures on the application of the sciences to the common purposes of life. Degrees were conferred annually on the last Wednesday in June.

The system of instruction thus outlined was un-

doubtedly novel in certain particulars. Its author or authors stoutly maintained that this was the case. Claims for its originality were made in a number of the early circulars. It is believed that Professor Eaton was responsible for the composition of most of these. We find under the head of "remarks," in a prospectus issued in 1827: "It will appear from a perusal of this pamphlet that this school is not Fellenbergian nor Lancastrian, but is purely *Rensselaerean*. The unwillingness to admit the *possibility* of an American improvement in the course of education which generally prevails, and the universal homage paid to everything European, has caused much effort to trace the Rensselaerean plan to some supposed shade of it on the other side of the Atlantic. Hitherto these invidious efforts have totally failed." Also: "These principles have now been practically applied for three years, to the full satisfaction of the patron and trustees. The method of teaching by lectures is original; though Capt. Basil Hall, of the British Navy, who is now making a tour of the United States, told me that Professor Pillans, of Edinburgh, had accidentally fallen upon that method in some degree, though he had received no account of this school, and that he set a high value upon it." Again, in a circular issued in 1833 there appears the paragraph: "It is well known that numerous colleges (literary and medical), academies, male and female seminaries, etc., now adopt the experimental method to a greater or less extent. Their not acknowledging the origin of these improve-

ments can never affect the feelings of the patron. It is sufficient for his purpose that the cause of education is improved and improving by his silent efforts, without show or loud pretentions."

The method of instruction pursued by Eaton was certainly neither that of Lancaster nor of Fellenberg, though it had points of similarity to both. His "officer of the day" performed some of the duties of the monitor in the Lancastrian system, both having charge of the classes for a certain period of the day; but here the similarity between the two methods ended. A short sketch of Fellenberg's efforts in the cause of education will indicate the difference between his schools and that of Van Rensselaer. Both men were actuated by the same motives—the education of those who could not afford to pay much for the privilege.

Emanuel de Fellenberg was a Swiss nobleman who, after taking part in the public affairs of his country during its occupation by the French, determined to devote his life and fortune to the instruction of the poor. In 1799 he purchased an estate at Hofwyl, in the canton of Berne, upon which he established his schools for this purpose. His "Agricultural Institution" or "Poor School" was founded in 1808. The fundamental principles in its government were the employment of agriculture for the moral education of the poor and the defrayment of the expense of their education by means of their own labor. About the same time a school of "Theoretical and Practical Agriculture" for all classes was formed. These were very suc-

cessful, and he soon afterwards commenced the formation of a normal school or seminary for teachers at his own expense. Forty-two teachers of the canton of Berne came together the first year and received a course of instruction in the art of teaching.

In 1827 he established his "Intermediate or Practical Institute," designed for the children of the middle classes of Switzerland. The course of instruction included all the branches which were deemed important in the education of youths not intended for the professions of law, medicine, or theology. The pupils belonged to families of men of business, mechanics, professional men, and persons in public employment whose means did not allow them to give their children an education of accomplishments. In addition to an ordinary scholastic course the pupils were all employed two hours each day in manual labor on the farm, in a garden plot of their own, in the mechanic's shop and in household offices, such as taking care of rooms, books, and tools.* It is, therefore, evident that a marked difference existed between any of Fellenberg's institutions and the Rensselaer School.

The practical demonstration of the success of the system adopted in the experimental school determined the patron and trustees to extend its usefulness by the establishment of what was called a "preparation branch," to accommodate those who were disqualified for entrance to the school proper

* American Journal of Education, Henry Barnard, Vol. III, Hartford, 1857.

either by want of education or because they were under seventeen years of age. It was a preparatory school for the regular course, and the exercises were of the same character though more elementary than those of the latter. A special laboratory was provided for this class. The studies to be pursued and other information relating to it were given in a circular dated September 14, 1826, which will be quoted in full.

PREPARATION BRANCH RECENTLY ESTABLISHED AT RENSSELAER SCHOOL

From a respect for the frequent solicitations of many gentlemen in the Southern States, and of some in the Northern, and from a desire expressed by the patron, to see the results of an extension of his plan, a *preparation branch* was this day established at this school, to go into operation on the third Wednesday in November.

The following is an outline of the Plan

1. The original method of instruction which has produced such unexpected results, called the Rensselaerean method, will be extended to this branch; to wit, that of exercising the student, on the forenoon of each day, by causing him to give an *extemporaneous dissertation* or *lecture* on the subject of his course, from concise written memoranda; and to spend the afternoon in *scholastic amusements*.

2. The circle of instruction is divided into five parts; and to each part is attached a course of *summer* and *winter* afternoon amusements. The following order will be observed in the fall and winter terms. In the spring term it will be inverted.

First Division. BOTANY and ETYMOLOGY. (The latter

branch will extend to so much knowledge of the structure of the Latin, Greek, and French languages as will enable the student to trace scientific terms to their themes, which are derived from those languages.) AMUSEMENTS. For *summer.* Collecting and preserving minerals, plants, and insects. For *winter* none, as this division will not be studied in the winter.

Second Division. GEOGRAPHY and HISTORY. AMUSEMENTS. For *summer.* Selecting specimens for illustrating the physiology of vegetation, and examining them under the common, and the solar, microscopes, and making drawings of their internal structure. For *winter.* Each making a globe of plaster of Paris, and drawing the chief subjects of geography upon it.

Third Division. Elements of PRACTICAL MATHEMATICS and of MORAL PHILOSOPHY. AMUSEMENTS. For *summer.* Land-surveying, taking the latitude, and performing simple hydraulic experiments. For *winter.* Making and using a set of mechanical powers, exercises in percussion with suspended balls, gauging, measuring cordwood and timber.

Fourth Division. LOGIC and RHETORIC. AMUSEMENTS. For *summer.* Experimenting upon the most common gases, as oxygen (obtained from vegetables by the action of light), nitrogen, hydrogen, carbonic acid (with its combination in soda-water), testing their specific gravities, etc., and experimenting upon aqueous exhalations—all to be performed with apparatus made with their own hands. For *winter.* Making and using galvanic batteries and piles, electrometers and magnets; and disengaging combined caloric by compression and affinity.

Fifth Division. Elementary principles of GOVERNMENT and LAW, and PARLIAMENTARY RULES. AMUSEMENTS. For *spring* and *fall.* Constructing dials, fixing meridians, constructing and using air-thermometers and hygrometers, taking specific gravities, using the blow-pipe and constructing the three elementary musical chords to illustrate the science of tones. For *winter.* Making camera-obscura

boxes; producing focal images by a pair of common burning glasses and ice lenses, and illustrating the microscope and telescope by the same; illustrating the laws of refraction and reflection by cheap mirrors and vessels of water, and separating the colored rays by ice cut into triangular prisms.

Candidates are admitted to the preparation branch who are deemed of sufficient discretion for going through the course, provided they have been successfully taught in reading, writing, common arithmetic, and English grammar. The Faculty of Rensselaer School are to judge upon their qualifications; but the Trustees have, in the second article of the by-laws of this branch, expressed an opinion that "the age of thirteen or fourteen years, and upwards, is best adapted to this course."

EXPENSES. *Tuition*, $1.50 for every three weeks, which constitutes a step in the circle. Students may enter either step in the circle at the commencement of every three weeks, reckoning from the beginning of each term. The terms or sessions of this branch correspond with the other terms of the School. *Board*, in commons with the other students, never to exceed $1.50 per week. Rooms will be furnished at or near the school, to be under the inspection and control of the faculty, at a small expense. No charge is made for the use of public rooms, library, chemical and philosophical apparatus, tools of the workshop, or the cabinet. And each student will attend the daily lectures of the Professors, free of charges. A student of strict prudence may pay all his expenses for the 42 weeks in each year, at this branch, with $120, as follows: Tuition, $21; board, $63; fuel and lights, $10; washing and lodging, $10; text books, $6; amusement apparatus, $10.

As this circular may fall into the hands of some who have not read the new code of by-laws passed April 3d, 1826, and the legislative act of incorporation, passed March 21st, 1826, it may be advisable to state as follows:

The Rensselaer School was founded by the Honorable Stephen Van Rensselaer, solely for the purpose of affording

an opportunity to the farmer, the mechanic, the clergyman, the lawyer, the physician, the merchant, and in short, to the man of business or of leisure, of any calling whatever, to become *practically scientific.* Though the branches which are not taught here are held in high estimation, it is believed that a school attempting every thing makes proficients in nothing. The Rensselaer School, therefore, is limited to an EXPERIMENTAL COURSE in the NATURAL SCIENCES. The studies of the preparation branch are extended no farther than is necessary, as auxiliaries to the experimental course.

The FALL TERM commences on the third Wednesday in July, and continues 15 weeks.

The WINTER TERM commences on the third Wednesday in November, and continues 12 weeks.

The SPRING TERM commences on the first Wednesday in March, and continues until the last Wednesday in June; which is the day of the annual commencement.

EXPENSES. All the same as in the preparation branch, with the addition of double the charge for tuition in the fall and spring terms, on account of the great additional labor required for teaching the student to perform with his own hands about sixteen hundred experiments in chemistry and natural philosophy. But students who have gone through a course in the preparation branch with success will not be required to attend the winter term. This will reduce the necessary expenses to about $95 for the whole experimental course.

Many unsuccessful attempts have been made to render science amusing to the youthful mind. They have generally proved very unprofitable, by diverting the attention of the student from literary pursuits, and by creating an attachment to useless, and often demoralizing, sports. By the plan adopted at this school, the objections to scholastic amusements are effectually obviated; and it will appear, by this circular, that those have been selected which will give due exercise to both body and mind. The muscular

powers of the body will be called into action, and their forces will be directed by mental ingenuity, until the student becomes familiar with the most important scientific manipulations, and particularly with those which will be most useful in the common concerns of life.

The Rensselaerean scheme for communicating scientific knowledge had never been attempted on either continent, until it was instituted at this school, two years ago. Many indeed mistook it, at first, for Fellenberg's method; but its great superiority has now been satisfactorily tested by its effects. As the *experimental school*, as well as the *preparation branch*, were founded solely for the public benefit by its disinterested patron, it is the particular desire of the trustees, that its excellences should be understood and imitated at other schools, as set forth in a former circular. Like other useful inventions, much expense was required for making the first experiment. Fortunately for science, the trial has been fairly made at the expense of many thousands, advanced by a single individual. Now it may be followed, in its chief advantages, by every school district; while the parent school at Troy will prepare competent teachers.

By order of the Trustees.

SAMUEL BLATCHFORD, *President.*

RENSSELAER SCHOOL, TROY, N. Y., Sept. 14, 1826.

CHAPTER V

THE NAME CHANGED TO RENSSELAER INSTITUTE. REMOVAL TO THE VAN DER HEYDEN MANSION

It has been seen that from its beginning an essential part of the educational system of the school consisted in an examination of workshops and factories in the neighborhood of Troy and in botanical and geological excursions in its immediate vicinity. It was determined to extend such excursions to more distant points in order to afford better facilities for the practical study of mineralogy and geology. At a meeting of the board of trustees held February 12, 1827, a by-law was passed requiring each student to make "a tour of about three weeks along the transition and secondary district of the Erie Canal immediately after commencement and across the primitive district in an eastern direction immediately after the close of the fall term." In a circular of six pages, written by Amos Eaton, entitled, "Rensselaer School Flotilla for the Summer of 1830," the programme of a proposed travelling tour for that year is given in detail. It was to begin on the twenty-third of June and to last ten weeks. Students taking it were to meet at the dock at the lower end of Cortlandt Street in New York City and to proceed by steamboat to Albany, whence a flotilla of canal-boats was to take them through the Erie Canal to Lake

Erie. They were to return by the same route. Daily lectures were to be given in the morning, and in the afternoon botanical and geological excursions were to be made. The boats were to move slowly so that specimens could be obtained at any point along the route. There is a list of twenty-nine places to be visited, Trenton Falls, Niagara Falls, and Lockport being included. This trip was not obligatory, and in succeeding publications three excursions which might be substituted for it are enumerated: one to the Connecticut River, one to the Helderberg, and the third to Carbondale, Pa., and Amboy, N. J.

At this time the total cost of attendance for one year, including excursions, was said to be $230, though it was observed that a young gentleman of tolerable economy could reduce this to $170.

At the trustee meeting to which reference has just been made there was also added to the curriculum the requirement that students should speak extemporaneously once a week during the winter term and twice a month during the other terms.

At the same time the first "Prudential Committee," consisting of the president and two trustees, was appointed. Succeeding boards have retained this committee, which has the power to perform, between the regular meetings of the board, such duties as can not properly be delayed.

To further increase the usefulness of the institution the faculty were authorized, May 24, 1827, to establish district branches in any part of the State when application was made and assurance given

by responsible persons that suitable rooms and sufficient apparatus would be supplied. The object was to accommodate those who wished to be educated and yet were unable to leave home for the whole or even a part of the year. It was provided that the branch students were to be taught that part of the annual course which did not require expensive apparatus; "for more than three-fourths of an experimental course of scientific instruction may be taught with apparatus worth but one hundred dollars; whereas the remaining fourth requires apparatus worth three or four thousand dollars." Should they desire, they might then come to the school, and after devoting nine weeks to that part of the course requiring expensive apparatus, they would be received as candidates for the Rensselaer degree on an equal footing with those who had spent the whole year at Troy.

Complete directions for introducing experimental science in academies and common schools were also given at this time. Besides information in relation to the regular work to be pursued, advice was given regarding the "amusements." Under this head occurs the clause: "A level sufficiently accurate may be made by any one, with the cost of a spirit-level tube of but a few shillings' value. Such students may then be taught the general outlines of civil engineering, land surveying, etc., in lieu of mischievous tricks, degrading contortions called gymnastics, and profane language." The circular from which this quotation is taken was dated September 19, 1828. There is added to it a note

in which we are informed that forty mechanics, members of the Mechanics' Institute of Troy, placed themselves under the direction of the Rensselaer School during the winter of 1827, and that most of them became tolerably proficient in experimental chemistry as applied to the arts and manufactures. They were not regular members of the school but paid one of the professors to teach them.

All these efforts show the active interest displayed by the founder and the officers of the school in the extension of the experimental system and the diffusion of scientific knowledge. To extend still further the benefits of the institution, Mr. Van Rensselaer, while in the House of Representatives, wrote from Washington the following letter to the president of the Institute. It was dated December 31, 1827:

"*Dear Sir:* I take the liberty of suggesting to you and the trustees the propriety of offering the school (over which you preside with so much dignity and usefulness) to the Legislature, to educate teachers, as proposed by Governor Clinton in his message at a former session of the Legislature—perhaps an amendment to the charter, extending the power of the trustees to change the location of the School, if they deem it necessary."

Nothing having come from this suggestion, he caused, in 1828, an invitation to be given to each county of the State to furnish a student, selected by the clerk of the county, for gratuitous instruction at Troy. This invitation was accepted by nearly all the counties. The students thus in-

structed were required to teach the experimental and demonstrative method in their own counties for a period of one year.

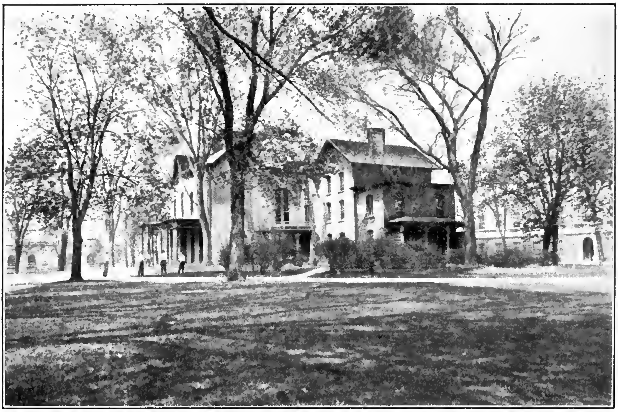
The authorities of the school seem also to have had, for those days, advanced ideas in regard to the education of women, for we find, as an addendum to a circular dated October 29, 1828, the following "*Notice by A. Eaton, in his private capacity.* 'At the urgent solicitations of several judicious friends, a lady, well qualified for the duty, will take charge of two experimental courses in chemistry and natural philosophy, in each year, for ladies: similar to the courses proposed for gentlemen in the annexed circular. They will be nine-week courses, at the same times and for the same charges. But no extemporaneous lectures will be required, excepting of those ladies who wish to prepare for giving instruction.'"

And in the minutes of the board there is a copy of a letter from Professor Eaton to the examiners, dated February 11, 1835, in which he requests them to give an informal examination to eight young ladies, who had been instructed for one quarter in practical mathematics, "so far as to be enabled to draw a fair comparison between the study of speculative geometry and algebra as generally practised in female seminaries and this mode of applying mathematics to the essential calculations of geography, astronomy, meteorology, necessary admeasurements, etc." The examiners complied with his request and were highly gratified at the progress made by the class.

It may be explained that all examinations, in the early period of the school's history, were made by boards composed of from three to six qualified persons appointed by the trustees. None of the members of these boards was connected with the school.

Professor Eaton's pronounced opinions upon the educational methods generally pursued in schools for young men have been illustrated in preceding pages. These extended to the education of women as well, and the manner in which he expressed them was quite as forcible in the one case as in the other. He remarks, at the end of a printed synopsis of the mathematical course for the year 1834–5: "The waste of time in many female schools, by the fashionable mummery of algebra, half-learned and never applied, has caused many to ascribe the failure in mathematics to the perversion of female genius, when it is drawn from elegant literature, music, painting, etc., to the severe sciences. The true cause is to be found in parsimony, which excludes competent teachers, badly selected subjects and wretchedly compiled text-books. Our country is inundated with wild schemes of learning; while the speculating book-sellers are sending their harpie-like pedlars to rob our youth of the last fragments of common sense."

Although by the year 1829, after a trial of four years, it had been conclusively proved that the experimental and demonstrative method, as they called it, was successful as a system of instruction, the institution had not been self-supporting. Its founder paid each year more than one-half of its



Dormitory, 1905–

Students' Club House, 1908–

Carnegie Building, 1906–

Walker Chemical Laboratory, 1906–

expenses. This was becoming burdensome to him, and he signified to the trustees his desire to discontinue it, and especially his intention of discontinuing the gratuitous education of county students after October, 1829. He did not, in fact, cease to contribute to the support of the school, but in consequence of this declaration it was "farmed out" in November, 1829, to Amos Eaton for a period of one year. He was constituted the "Agent" of the trustees to transact all the pecuniary business of the institution, which, however, was to remain under the control of the board. He relinquished all claim for compensation, and in consequence was authorized to receive and expend all moneys at his discretion and to retain all profits for his own benefit. An inventory of the property was made and he was permitted to use it for purposes of instruction. This arrangement was continued for one year only, as he terminated it in September, 1830, although he still acted as agent and retained his position as Senior Professor.

In spite of pecuniary embarrassments, improvements were continually being made both in the instruction and the equipment of the laboratories. The prospectus for the eighth annual course shows that in 1831–2 the year had been divided into seventeen sub-terms of three weeks each, of which, however, three, called "reading terms," might be used either to visit friends or for a course of reading in the library. The fifteenth and sixteenth sub-terms were occupied in the travelling tours to which reference has been made.

During the morning exercises of the year, each student had to give one hundred and eighty extemporaneous lectures, upon which he was closely criticized. These lectures were illustrated by about twelve hundred experiments performed by himself, and by "suits" of minerals, plants and animals.

At this time the equipment included a reading-room, a natural history room, a philosophy room, and three laboratories. Considerable additions had been made to the apparatus as described in the circulars of 1826. The philosophy room now contained an air-pump, a force-pump, barometer, thermometers, pluviometer, solar microscope, megascope, standing microscope, magic lantern, telescope, lenses, convex and concave mirrors, prisms, electrical-machine, galvanic battery, electromagnetic instruments, magnets, sextant, theodolite, compass and chain, mechanical powers, hydrostatic bellows, hydrostatic and hydraulic cylinders and tubes, hydrometers and glass pumps.

The laboratories were furnished with the necessary forges, furnaces, bellows, lead-pots, Argand lamps, common lamps, iron retorts, or gun-barrels for gases, anvils, anvil hammers, cisterns, pipes for conducting gases from the barrels, gas-pistol, iron stand, iron mortar, and mercurial bath.

In the meantime, the Rev. Samuel Blatchford, after earnest and successful labor in behalf of the school, died March 27, 1828, and was succeeded by the Rev. John Chester, a clergyman of Albany, who was appointed June 25, 1828. His term was, however, a short one, as he was compelled, on account

of ill health, to resign in about six months. He was succeeded by the Rev. Eliphalet Nott, appointed September 2, 1829, who was at the same time president of Union College.

During the first seven years of its existence the school had been situated at the corner of Middleburgh and River streets, in the building formerly occupied by the Farmers' Bank, and known, at the time of its establishment, as the Old Bank Place. Partly because it had not yet become self-supporting and partly because it was, in some respects, not conveniently situated, it was determined to obtain authority from the Legislature to change its location if satisfactory arrangements could be made. An act was consequently passed April 26, 1832, which gave the trustees power, after October 23, 1832, if the patron consented, to remove to the site of the Greenbush and Schodack Academy, in the town of Greenbush, in Rensselaer county, and to unite with this academy if its trustees consented. In this case the united institution was to be called the Rensselaer Institute. If, however, the patron or the trustees of the academy objected, the trustees of Rensselaer School were given authority to remove the institution, after the consent of Stephen Van Rensselaer had been given, to any part of Rensselaer county and to continue as an experimental and classical school under the name of the Rensselaer Institute.

The inquiries and negotiations made, in relation to the removal to Greenbush, were not satisfactory, as may be seen from the following letter written by

the patron to the Rev. Dr. Nott and read at a meeting of the board of trustees held November 18, 1833:

"ALBANY, November 18, 1833.

"*To the President and Trustees of the Rensselaer School:*

"*Gentlemen:* Sufficient provision for the support of said school not being offered to its location at Greenbush, according to the first section of the amendment of April 26, 1832, I feel bound in duty to object to its removal to Greenbush. But under present circumstances, I cheerfully consent to a removal to the Van der Heyden mansion, or to any other suitable building near the central part of said city of Troy.

"Respectfully your humble servant,

"S. V. RENSSELAER."

Among the by-laws passed at this meeting was one by which the name of the school was changed to the "Rensselaer Institute," which was to include an "experimental and classical department." At the same time, the scholastic year was divided into two terms instead of three, the winter term, sixteen weeks in duration, to commence on the third Wednesday in November; and the summer term, of twenty-four weeks, to begin on the last Wednesday in April. Each term was divided into subterms of four weeks each. It was also resolved to remove to the Van der Heyden mansion on or before April, 1834. This building was selected on account of its size and convenience of access. It

was situated on the southwest corner of Eighth and Grand Division streets, and the removal took place in April, 1834.

During the occupation of the Old Bank Place the number of students at any one time had never exceeded and was generally less than twenty-five. The number of teachers was regulated by the number of students, one being assigned to each section of five or six. The triennial catalogue for 1832–3–4 gives a list of twenty-five instructors who had already been connected with the school. The small number of students was partly due to the standard required for entrance to the regular course; at one time twelve of the twenty-five present were graduates or members of colleges. In the notices for the ninth annual course, 1832–3, during the time that the change of location was being considered, it is remarked: "None are received but those whose minds are disciplined to habits of study. Hence it is that the patron has already advanced over twenty-two thousand dollars in support of the school for eight years. To improve the plan of education is his object; not to establish a school at any particular location. Therefore, patronage is not asked. These terms are printed, not for the benefit of the school, but for the benefit of those who wish to profit by the improvements made by trials which cost the patron many thousands."

The first clause of the preceding quotation could hardly have referred to the junior members of the school, in the Preparation Branch; as Rule 8 of the by-laws of 1835 reads: "In case of any disobe-

dience of any juniors to orders of teachers, after being particularly called to obey, it shall be the duty of said professor to lay hands on such disobedient student and remove him from the premises, or confine him (in such a manner as to cause no personal injury) for a time not exceeding two hours. But no beating or flagellation shall in any case be permitted at the Institute."

CHAPTER VI

ESTABLISHMENT OF THE DEPARTMENT OF CIVIL ENGINEERING

THE preceding pages show that the original intention of the founder was to establish a school for the diffusion of scientific knowledge, and that his object more particularly was to disseminate among farmers, mechanics, and the poorer classes generally information in relation to the application of scientific principles to their various occupations which would enable them to improve their material condition. At the same time, the management of the institution was of too broadminded a character to permit its benefits to be confined to any particular branch of practical science, and, although many of those who had up to this time been graduated afterward became eminent in various departments of pure and applied science, the renown of the school is principally due to the work of its alumni in the field of engineering—a course in which was about to be added to the curriculum.

Some of the principles of certain branches of the science now broadly called civil engineering had been known, of course, since the earliest historical times. Besides various branches of natural science some of these principles were taught, in this country, in the early founded schools and colleges to

which reference already has been made. They were taught, also, in the Military Academy at West Point, which was established in 1802, though it was a school in name only until its reorganization after the war of 1812. No school of civil as distinguished from military engineering, however, had yet been established in any English-speaking country, although on the continent of Europe a number of technical institutions had been founded, most of which were maintained partly or wholly at the expense of the state. The École des Ponts et Chaussées was established in France as early as 1747, though it did not become of importance as a school for engineers until a much later period, and the Königliche Sächsische Bergakademie (Freiberg) was founded in 1765. Among other continental technical schools of early date which afterwards became well known may be mentioned the École Polytechnique (Paris, 1794), a school of general science, having for its principal object the preparation of students for several special government technical institutions, including the School of Bridges and Roads above mentioned; the Polytechnisches Institut (Vienna, 1815), intended for the education of engineers, architects and manufacturers; and the Königliches Gewerbe Institut (Berlin, 1821), which at the time of its foundation and for twenty-five years thereafter was, as its name indicates, a trade rather than an engineering school. The Technische Böhmische Ständische Lehranstalt (Prague) came into existence in 1806. Beside these, which depended largely upon govern-

ment aid, a private institution, the École Centrale des Arts et Manufactures (Paris, 1829), attained prominence as a school of engineering immediately upon its establishment. Before 1835 a few other technical schools of less importance, containing trade-school features, had been founded in the German states.

The continental schools of science antedated those of Great Britain. Among the English schools in which scientific instruction was early given, may be mentioned University College, London, which was opened in 1828 under the name of the University of London, and King's College, London, established by royal charter in 1829. In the University of London engineering subjects were first taught in 1840 and in the same year a chair of civil engineering and mechanics was established by Queen Victoria in the University of Glasgow. The School of Engineering in Dublin University (Trinity College) was founded in 1842. The other well-known British schools of science were established at still later dates. Among them are Owens College, Manchester (1851); the Department of Engineering in the University of Edinburgh (1868); the Royal Indian Engineering College, London (1871), and Mason College, Birmingham (1875).

Although science and some branches of engineering were taught in the early foreign schools, at the time of the foundation of Rensselaer School, there were few engineers other than military engineers. The term Civil, in distinction from Military, engineer had been coined during the last quarter of

the eighteenth century, it is believed by Smeaton,* but it did not come into general use until about the end of the first quarter of the nineteenth century. There had been, of course, inventors and constructors of genius throughout all the ages. Great ruins on more than one continent attest the skill of forgotten engineers. During the Renaissance, Brunelleschi, Michael Angelo and the great Leonardo da Vinci lived and builded, and at the later period, about which we have been speaking, such names as Smeaton and Watt and Fulton come to our minds. But these men had not had an engineering education in the schools.

There were no schools of engineering in the United States because civil engineering had hardly yet been recognized as a profession. A consideration of the condition of the country and of the state of scientific knowledge as applied to the constructive arts towards the beginning of the nineteenth century shows why this was the case. In comparison with the European states, in which the early schools of science above mentioned had been established, the country was new and sparsely settled. In the year 1800 the total population of the United States was only 5,300,000. In the same year the state of New York contained 589,000 and New York City only 60,000 inhabitants. In 1830 the country had 12,866,000 inhabitants, while New York State had 1,919,000, and New York City

* Address of J. C. Inglis, President of the Institution of Civil Engineers of Great Britain, November 2, 1909. Published by the Institution, London, 1909.

203,000. Troy was a village of 1,800 people at the former period, and in 1830 this number had increased to 11,500. Methods of communication were primitive and travelling was expensive.

No canal of considerable length (and these were the first engineering works of great magnitude to be built here) was begun until after the conclusion of the second war with England, that of the Schuylkill Coal and Navigation Company, 108 miles in length, being commenced in 1816 and finished in 1825. Others in Pennsylvania were commenced about the same time, and both the Erie and Champlain canals were begun in 1817. By the end of the first quarter of the century about 1,400 miles of these waterways had been built; but no steam railroads existed, locomotives not becoming practically successful until about 1830. The first ones used weighed only three or four tons, although in the years 1836–7 Baldwin of Philadelphia built eighty weighing from nine to twelve tons each.

Steam navigation was in a more forward state: the Clermont, a steamer one hundred and thirty-three feet in length, built by Fulton and Livingston in 1807, having made the trip up the Hudson River from New York to Albany in thirty-two hours. A steam ferry-boat ran between Jersey City and New York in 1812, and in 1815 there were steamboats running between New York and Providence. In the year 1830 there were eighty-six steamers on the Hudson River and Long Island Sound. The first steamship to cross the Atlantic was the Savannah, of 350 tons, built at Corlears

Hook, N. Y. The engines, however, were used only eighteen out of the twenty-five days required for the passage from Savannah to Liverpool, and sails had to be depended upon for the remainder of the trip. It was not until 1838 that the transatlantic voyage was made wholly by steam. In this year the Sirius, of 700 tons, crossed from Cork to New York in nineteen days, and the Great Western, of 1,340 tons, made the passage from Bristol to New York in fifteen days.

In the early days of the country the small amount of power required for manufacturing purposes was obtained principally from wind and water wheels. Of the latter, undershot, overshot and breast wheels were employed; and Francis says that until 1844 high-breast wheels were considered the most perfect water-wheels that could be used. Although Fourneyron had erected his first turbine, in France, in 1827, and Elwood Morris of Pennsylvania had shortly afterwards built and put two of them in operation in this country, other wheels of this type were not used here until about the middle of the century. Boyden designed his turbine in 1844; and the Manufacturing Companies at Lowell, which had begun to improve the water-power of the Merrimac in 1822, purchased the right to use it in 1849.

The practical application, in Great Britain, of the steam-engine to pumping water from mines led to the introduction of the first one of any size ever used in America. All of its principal parts were imported from England and a mechanic was sent

over to erect and run it. It was put together in 1763 at the Schuyler copper-mine on the Passaic River, a few miles above Newark, N. J. Frederick Graff says * that in 1803 there were in use in the United States six steam-engines beside the one referred to above; two at the Philadelphia water-works, one just about being started at the Manhattan water-works in New York, one in Boston, one in Roosevelt's saw-mill in New York, and quite a small one used by Oliver Evans to grind plaster of paris, in Philadelphia. The first steam-engine built in America is said to have been constructed in 1772 by Christopher Colles for a distillery in Philadelphia, but it was very defective. Those of the Philadelphia water-works were built in 1800 at the Soho Works of Roosevelt, near Newark, N. J. From this time onward the application of steam as a source of power for manufacturing purposes increased with the demands of the times. Improvements—dictated by experience, for little was known of the theory—were continually made, and by the middle of the century the various types had assumed practically the proportions used at the present time.

One of the first tunnels built in the United States was on the Allegheny Portage Railroad in Pennsylvania. It was built in 1831 and was 900 feet long. The Black Rock tunnel on the Reading Railroad was built in 1836. It was 1,932 feet long.

* Notice of the Earliest Steam-engines used in the United States, by Frederick Graff, in Journal of the Franklin Institute, 1853.

In 1820 one of the first cast-iron water-mains in the country was laid for the Philadelphia water-works.

Bridges of wood and stone had, of course, been built almost from the time of settlement of the country. Some of the former were of long span and reflected the greatest credit upon the genius of their constructors, who, however, had only empiric methods of proportioning the parts. Palmer, Burr and Wernwag were the most noted builders at the beginning of the century. The Piscatauqua bridge, built by Palmer, near Portsmouth, N. H., included an arch span 244 feet in length; and his Schuylkill River bridge had two arch spans 150 feet and one 195 feet long. Between 1804 and 1808 Burr built his Waterford, Trenton and Schenectady bridges, with spans ranging from 150 to 203 feet, and, from 1812 to 1816, the Harrisburgh bridge, with twelve spans of about 210 feet each. Wernwag built his "Colossus" over the Schuylkill at Philadelphia in 1812. The span was 340 feet. Town patented his lattice truss in 1820, and Howe's patent was not taken out until 1840. The era of iron bridges did not begin until 1840. Finley had built a number of small suspension bridges of chain cables between 1796 and 1810; and in 1810 Templeman replaced the 160-foot span of Palmer's Essex-Merrimac bridge by one of chain cables. Paine's memoir on cast-iron bridges was printed in 1803, and Canfield took out the first patent for an iron truss bridge in 1833; but the first iron truss bridge built in this country

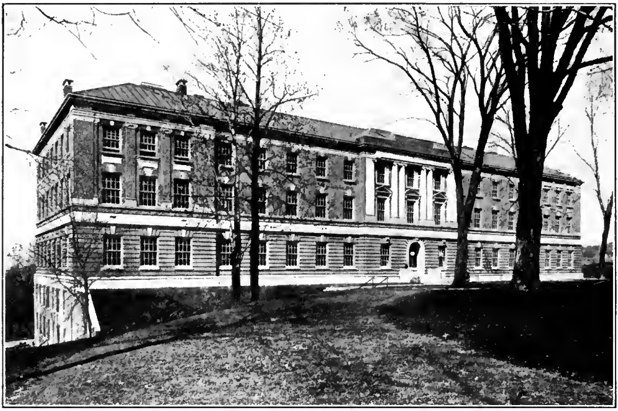
is believed to be the one erected in 1840 by Trumbull over the Erie Canal at Frankford.* In the same year Whipple built his first iron bridge.

The few historical facts above given serve to indicate the condition of engineering science at the period of the school's history which we are now considering. Although many of the fundamental principles of applied mechanics were known as well then as now, the development of the science, particularly in its application to structures and machines for the production of useful work, had taken place largely upon empiric lines. Most of the eminent men to whom this development had been due were self-taught, were mechanics whose results had been obtained by successive experiments and with little knowledge of the resistance of materials or of the principles of the design of engineering constructions as practised to-day. And if with these conditions there are taken into consideration the comparative smallness of the population and its extended geographical distribution, the wise forethought and liberality of mind displayed by the authorities of the school in establishing at such an early date a department of civil engineering will be thoroughly appreciated.

In the pamphlet published in March, 1825, giving the constitution and laws of the school an outline of the course of study was printed among

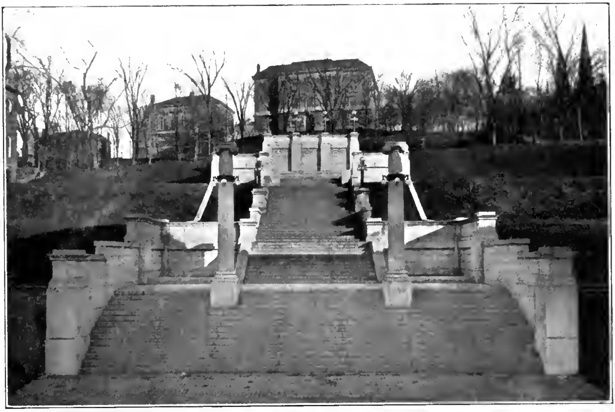
* American Railroad Bridges, by Theodore Cooper, in Transactions of the American Society of Civil Engineers, July, 1889.

the by-laws. This included instruction in land surveying, mensuration, measurements of the velocity of flow of water in rivers and aqueducts and other subjects now to be found in the curriculum of a course in civil engineering. These by-laws were elaborated in the circular of April, 1826, and Article 3, printed on a previous page of this history, shows that instruction was given in hydrostatics and hydrodynamics, including calculations upon the application of water power, as well as steam, to various machines. The catalogue published in 1828 gives the duties of the Senior Professor. Besides other subjects he was required to give lectures on land surveying and civil engineering. This is the first appearance of the term "civil engineering" in any of the circulars, and no well-defined course in the subject was formulated for several years. In the "Notices for the Eighth Annual Course" (1831–2), to which reference has before been made, the first sub-term, beginning November 16, was devoted to "Practical Mathematics, including mensuration applied to land surveying, timber and cord-wood measure, excavations, docks, etc.," and the second sub-term, from December 7 to December 28, to "Trigonometry, Navigation and the elements of Civil Engineering." The fifteenth and sixteenth sub-terms, from September 12 to October 24, were occupied in the "application of Engineering and Natural History to the occurrences of four travelling tours—to Connecticut River, to the Helderberg, to Carbondale coal beds and to New Jersey."



Russell Sage Laboratory, Front View, 1909–

Russell Sage Laboratory, Rear View; Boiler House, 1908–



Approach at Head of Broadway, 1907–

Approach, with Students

These quotations include all references to the subject; and in the "Notices" for the ninth annual course civil engineering is not specifically mentioned, though this was an octavo circular containing only three printed pages.

In 1833 the curriculum in the experimental department contained "Practical Mathematics, including Surveying, Engineering, Navigation, Latitude and Longitude, etc., from the 3rd Wednesday in November, 12 weeks." In the original minutes of the board of trustees we find a record of the examinations of fourteen students in surveying and in engineering. These were held February 11 and 12, 1834.

Up to this time the degree of Bachelor of Arts, A.B. (r.s.), was the only one conferred by the institution, and although the course in engineering had been gradually developing it had not yet been differentiated from that in general science. Preparatory to the separation of these two branches the Legislature was petitioned to amend the charter of the school. This was done by an act dated May 9, 1835. The second section of this law reads as follows: "The said board of trustees shall have the power to establish a department of mathematical arts, for the purpose of giving instruction in engineering and technology, as a branch of said institute; and to receive and apply donations for procuring instruments and other facilities suitable for giving such instruction in a practical manner, and to authorize the president of said institute to confer certificates on students in said department

in testimony of their respective qualifications for practical operations in the mathematical arts."

At a meeting of the board of trustees held May 22, 1835, their number was increased, in accordance with a provision of the above-mentioned act, by the addition of the Mayor, Recorder and Alderman of the Fourth Ward of the city of Troy; and it was resolved that "A department of Mathematical Arts is hereby established as a branch of the Institute for the purpose of giving instruction in Engineering and Technology." At the same meeting it was decided that the degree of Bachelor of Natural Science, B.N.S., should thereafter be conferred instead of Bachelor of Arts, and that graduates in the department of Mathematical Arts should receive the degree of Civil Engineer. Also that "no one shall receive the last-mentioned degree until he shall have been regularly disciplined at this school at least two quarters, after being well taught in elementary mathematics here, or elsewhere."

The first class in civil engineering was graduated in 1835. The first four candidates for the degree were recommended in the following letter from the examiners, dated October 14, 1835:

"*To the Revd. E. Nott, D.D., President:*

"We have examined Edward Suffern, William Clement, Jacob Eddy, and Amos Westcott as candidates for the degree of Civil Engineer. We find them acquainted with the theory of practice. But as this is the first class proposed to be graduated, their own honor and the honor of this institution

demand great caution in conferring degrees. We therefore recommend as follows: that they receive the degrees but that the diplomas be left with the Secretary until the President shall receive satisfactory certificates that they have reviewed their text books (outlines Gregory), that they can read algebraic equations, and have a general knowledge of Perspective generally.

"A. R. Judah, *Chairman*.
"P. H. Green,
"Harvey Warner, } *Examiners*."

By this time a complete curriculum in civil engineering had been established. It was printed in a circular which will be given in full, as it is believed to be the first prospectus of a school of civil engineering ever printed in English. It is well worth perusal, not only because the curriculum outlined contains much information regarding the most advanced scientific instruction given in this country at that period, but because the concluding paragraphs throw a curious light upon the expenses of students and the general requirements necessary for graduation.

NOTICES OF RENSSELAER INSTITUTE

Troy, N. Y., October 14, 1835
[Being the answer to letters of inquiry.]

Hon. Stephen Van Rensselaer, Patron, with the right to appoint the Annual Board of Examiners.

ACTING FACULTY

Rev. E. Nott, D.D., President—also President of Union College.

Judge DAVID BUEL, Jr., Vice President.

AMOS EATON, Senior Professor, and Professor of Civil Engineering; also holding the Agency and Supervision of the Institute.

EBENEZER EMMONS, Junior Professor.

JAMES HALL, Professor of Chemistry and Physiology.

Assistants—Edward Suffern and D. S. Smalley.

Instruction, wholly practical, illustrated by Experiments and Specimens, is given 40 *weeks in each year.* Five days in each week the forenoon exercises are from 8 A.M. to 1 P.M.

WINTER SESSION commences the third Wednesday in November, and continues 16 weeks. During the first 12 weeks, each forenoon is devoted to practical Mathematics, Arithmetical and Geometrical. This is a most important course for men of business, young and old. During the last 4 weeks of the Winter Term, extemporaneous Speaking on the subjects of Logic, Rhetoric, Geology, Geography, and History, is the forenoon exercise. Throughout the whole session the afternoon exercises are Composition, and in fair weather, exercises in various Mathematical Arts. A course of Lectures on National and Municipal Law is given by the Senior Professor.

SUMMER SESSION commences on the last Wednesday in April, and continues 24 weeks: ending with Commencement.

Students of the Natural Science Department are instructed as follows:

Three weeks, wholly practical Botany, with specimens.

Four weeks, Zoology, including organic remains; and Physiology, including the elements of Organic Chemistry.

Three and a half weeks, Geology and Mineralogy, with specimens.

Three weeks, traveling between Connecticut River and Schoharie Kill, for making collections to be preserved by each student, and exhibited at examinations; also for improving in the knowledge of Natural History and Mathematical Arts.

Ten weeks, Chemistry and Natural Philosophy.

Half a week, preparing for examinations and Commencement.

The afternoons of all fair days are devoted to Surveying, Engineering, and various Mathematical Arts—also to Mineralizing, Botanizing, and to collecting and preserving subjects in Zoology.

Students of the Engineer Corps are instructed as follows:

Eight weeks, in learning the use of Instruments; as Compass, Chain, Scale, Protractor, Dividers, Level, Quadrant, Sextant, Barometer, Hydrometer, Hygrometer, Pluviometer, Thermometer, Telescope, Microscope, etc., with their applications to Surveying, Protracting, Leveling, calculating Excavations and Embankments, taking Heights and Distances, Specific Gravity and Weight of Liquids, Degrees of Moisture, Storms, Temperature, Latitude and Longitude by lunar observations and eclipses.

Eight weeks, Mechanical Powers, Circles, Conic Sections, construction of Bridges, Arches, Piers, Rail-Roads, Canals, running Circles for Rail-Ways, correcting the errors of long Levels, caused by refraction and the Earth's convexity, calculating the height of the atmosphere by twilight, and its whole weight on any given portion of the Earth, its pressure on Hills and in Valleys as affecting the height for fixing the lower valve of a Pump; in calculating the Moon's distance by its horizontal parallax, and the distances of Planets by proportionals of cubes of times to squares of distances.

Four weeks, in calculating the quantity of Water per second, etc., supplied by streams as feeders for Canals, or for turning Machinery; in calculating the velocity and quantity effused per second, etc., from flumes and various vessels, under various heads; the results of various accelerating and retarding forces of water flowing in open raceways and pipes of waterworks, and in numerous miscellaneous calculations respecting Hydrostatics and Hydrodynamics.

Four weeks, study the effect of Steam and inspect its

various applications—Wind, as applied to Machinery; also Electro-Magnetism—inspect the principal Mills, Factories, and other Machinery or works which come within the province of Mathematical Arts; also, study as much Geology as may be required for judging of Rocks and Earth concerned in construction.

Fees for instruction, including all Lectures, Experiments, etc.; also for use of Instruments, Apparatus, Library and Specimens, $4 for each sub-term of four weeks. No student received for less than a sub-term. No extra charge excepting $8 for the course of Experimental Chemistry, where each student gives a course of experiments with his own hands.

Students furnish their own fuel, light, and text-books. Each boards where he pleases; but the Professors will aid strangers in the selection of boarding houses. A small number of strangers are boarded at the School at $2 per week; they furnishing their own bedding, washing, etc.

The Rensselaer degree of Bachelor of Natural Science is conferred on all qualified persons of 17 years or upwards. The Rensselaer degree of Civil Engineer is conferred on candidates of 17 years and upwards, who are well qualified in that department. This power was given to the President, by an amendment to the Charter, passed last session of the Legislature. Candidates are admitted to the Institute who have a good knowledge of Arithmetic, and can understand good authors readily, and can compose with considerable facility.

After a trial of two seasons, it is found to be inexpedient to enter young lads in the regular divisions, before they have sufficient pride of character to govern their conduct when preparing for their exercises in the absence of a teacher; arrangements will, therefore, be made for having a teacher always present with them, when they are not in the immediate charge of a Professor or Assistant.

Students in any one department have the right to attend one Experimental Lecture each day in the other departments, free of expense.

One year is sufficient for obtaining the Rensselaer degree of Bachelor of Natural Science, or of Civil Engineer, for a candidate who is well prepared to enter. Graduates of Colleges may succeed by close application during the 24 weeks in the Summer term.

Candidates may commence the course at the beginning of any sub-term; but the third Wednesday of November to be preferred, unless the candidate is a graduate of a regular College or otherwise well instructed in general Mathematics and Literature. In such cases the last Wednesday in April is the most suitable time of entering. His theoretical views may then be reduced to practice during the Summer course.

The degree of Master of Arts is conferred after two years of practical application.

Gentlemen wishing to learn the outline of the terms of the Rensselaer Institute are requested to pay postage on their letters; and they will receive this printed notice. If this appears to be a "*narrow notice*," I will state that I paid $54.28 in one year in postage for letters on others' business: some for our school course, more for advice about mines, minerals, and visionary projects.

AMOS EATON, *Agent.*

RENSSELAER INSTITUTE, Troy, Oct. 14, 1835.

A better understanding of the scope of the instruction given, about this time, may be obtained from an examination paper covering the work of the winter term in the department of Mathematical Arts. This was submitted to fifteen students; and the results of the examination are given in a report of three examiners, dated February 23, 1836. There were fifty-three questions, which will be found in Appendix I.

A "Periodical Notice" of Rensselaer Institute

dated 1838 and 1839 is addressed "To Principal Engineers and Commissioners of Rail-Roads, Canals, Topographical Surveys, Milling-Works, Water-Works, etc. Also, to Teachers of Scientific Institutions, where practical instruction is required, in Chemistry, Geology, Botany, etc." Several paragraphs from it are quoted as follows:

"This Institute has been in full operation for fourteen years. It has furnished numerous practical men in the above departments, including Geological Surveyors, etc., to many States of the Union, to the West Indies, Mexico, Peru, Chili, etc."

"As Engineering Schools are advertised in many cities, villages, etc., where the instruction promised does not agree, in scarcely a single item, with what is understood by the officers of this Institute to be essential to the Engineer, it seems to be a duty to state definitely what qualifications are demanded of students, to entitle them to certificates in particular departments, and to full degrees in Civil Engineering."

"Practical civil engineering, according to the meaning attached to the expressions at this Institute, includes all the above qualifications,* *at the very least.* Students are taught all these things and many others, with the appropriate instruments in their hands, accompanied by short lectures of their own. And still they find themselves in need of years of labor in the field as assistants, before they are willing to come forward as *chief engineers.* How other schools manufacture engineers, as set forth in various advertisements, is a mystery not yet developed here."

* The qualifications referred to in the second paragraph, twenty-three in number, are given in Appendix I.

CHAPTER VII

REORGANIZATION OF THE SCHOOL. THE RENSSELAER POLYTECHNIC INSTITUTE

THE fourth act of the Legislature relating to the Institute was passed May 8, 1837. It permitted the Troy Academy to be revived and united with the school. The new institution was to be named the Rensselaer Institute and was to consist of two separate branches, one to be called the department of experimental science and the other the department of classic literature. No such combination, however, resulted. By the same act the school was made subject to the visitation of the Regents of the University of the State and was declared to be entitled to the same privileges, government funds and other advantages as the academies, colleges and other schools of the higher order when it complied with the terms required by law and the rules of the Regents.

At a meeting of the trustees held September 25, 1841, the prudential committee was empowered to place the institution under the supervision of the Regents. Nothing was done in this direction, however, and on April 30, 1845, this committee was again authorized to consider the question. An application dated January 29, 1846, which contained a complete inventory and valuation of the

property, was accordingly presented, and, in consequence, on the fifth of February of the same year the school was made subject to the visitation of the Regents, being classed as an academy until after its reorganization in 1849–50. Annual reports were made for eight years, and during this time it received a small amount of money, $744 in all, as its share of the literature moneys distributed to the academies of the State. In 1854 the authorities declined to make further reports, on the ground that the school had little in common with the academies. They were again made in 1869 and 1870, the institution being then classed as a scientific school. Another is found in the Report of the Regents for 1880, and since 1882 they have been made annually. They are now compulsory.

Upon the removal of the Institute, in May, 1834, from the Old Bank Place to the Van der Heyden mansion, a five-years' lease of the latter place was made; and in order to provide proper facilities for the students, the Patron caused a laboratory and study rooms to be built upon its grounds. After his death, which occurred January 26, 1839, the lease was renewed for two years. During this period the school suffered by the mutilation and final destruction, under the orders of the road commissioners of Troy, of the buildings erected by Mr. Van Rensselaer, and, as the agent of the property refused to restore them, at the expiration of the lease on May 1, 1841, a return to its original location was effected. Its second occupation of the Old Bank Place was only three years in duration.

In 1843 the infant school lot situated on the northeast corner of State and Sixth Streets, with a frontage of one hundred feet on Sixth Street and of ninety-eight feet on State Street, was offered as a gift by the city to the trustees, with the condition that William P. Van Rensselaer, a son of the founder, should give to the institution a sum of money equal to the value of the property. There was upon the lot a brick building fifty by thirty feet in size which was valued at $2,500. The property was appraised at $6,500, and, the condition being accepted by Mr. Van Rensselaer, was deeded to the trustees June 1, 1844. The $6,500 in money thus obtained was invested as a permanent fund, and at the same time $1,260 was raised by subscription for the purpose of building a laboratory. This was a one-storied brick building fifty by twenty-six feet in size, and was built upon the lot in 1844. It cost $1,150. In the same year these two buildings were occupied by the school.

In the complete inventory contained in the application to the Regents made January, 1846, the buildings and lot were valued at $7,650; the library of three hundred and ninety-six volumes at $973.45, and the surveying instruments, apparatus, and specimens at $537.63. The money in possession of the trustees amounted to $6,690, so that the total estimated value of the property of the Institution was $15,851.08. The total debts at the same time amounted to $1,050.

In the catalogue for the thirty-fifth semi-annual session, published in 1841–2, during the second

occupancy of the Old Bank Place, is given a list of students for the years 1839, 1840, and 1841, with their ages and addresses. During these three years there were seventy-seven students, most of whom came from the State of New York. Twelve of them, however, came from Connecticut, Maryland, New Hampshire, New Jersey, Pennsylvania, Tennessee, Vermont, and Canada. Their ages varied generally between seventeen and twenty-five years, the average being twenty years. The list for the years 1840, 1841, and 1842, given in the catalogue of 1842–3, contains the names of seventy-five students of whom ten were not residents of the State. One of them came from the territory of Wisconsin. During the next few years, until the extension of the course of study, the number varied between thirty-five and sixty-five annually, with an average age of about nineteen years. These numbers include students, of whom there was always a considerable number, who took partial courses and stayed only part of the year.

Amos Eaton having died May 6, 1842, George H. Cook, of the class of 1839, afterwards widely known for his work as State Geologist of New Jersey, was appointed Senior Professor and Agent, September 19, 1842. He had previously been appointed Assistant Professor in March, 1840; Adjunct Professor of Civil Engineering in October, 1840, and Professor of Chemistry, Mineralogy, and Zoology in September, 1841. His duties as Senior Professor included the delivery of courses of lectures on geology, chemistry, and civil engineering. After some-

what extending the courses of study he resigned in 1846. His resignation was accepted by the board of trustees, with resolutions of regret, at a meeting held November 30, 1846, and on the same date B. Franklin Greene, Professor of Mathematics and Natural Philosophy in Washington College, Maryland, was appointed Senior Professor. He was graduated from the Institute in the class of 1842 with the degrees of Civil Engineer and Bachelor of Natural Science, and had been teaching at Washington College since 1843. In assuming the duties of Senior Professor he became at the same time Professor of Mathematics and Physics.

In the meanwhile the resignation of Dr. Nott had been accepted April 30, 1845, and Rev. Dr. N. S. S. Beman, who had been Vice-president since 1841, was elected President in his place.

The acceptance of the direction of the Institute by B. Franklin Greene marks an epoch in the history of the school. With the exceptions of its founder and Amos Eaton, it owes more to him than to any other person. Up to this date the course had been one year in duration, and although this length of time spent at the school did not necessarily insure the acquirement of either of the degrees, which were given only after satisfactory examinations had been passed, the average student who came reasonably well prepared could complete either of the courses in this period. After a careful study of the scientific and technical institutions of Europe, Professor Greene thoroughly reorganized the curriculum. This reorganization,

which included a material enlargement of the course of study and the requirement of a more rigid standard of scholarship from candidates for degrees, took place in the years 1849–50.

Professor Greene, who in the meanwhile had become Director of the institution when that office was created by act of Legislature in 1850, published in 1856 a pamphlet of eighty-seven pages, entitled "The Rensselaer Polytechnic Institute. Its Reorganization in 1849–50; Its Condition at the Present Time; Its Plans and Hopes for the Future." This, as its title indicates, was descriptive of the reorganization. Quotations from it will show more clearly the character of the changes and the intentions of the authorities:

"The managers of the Institute therefore resolved that *their field should be narrowed and more thoroughly cultivated;* that, indeed, their educational objects should be restricted to matters immediately cognate to Architecture and Engineering; that, moreover, for a somewhat irregular and for the most part optional course, requiring but a single year for its accomplishment, they would substitute a carefully considered curriculum which should require at the least three full years of systematic and thorough training; and that, finally, they would demand the application of the strictest examination tests to the successive parts of the course prescribed, not only in respect to the translation of students from lower to higher classes, but, especially, in all cases of ultimate graduation with professional degrees. It was in accordance with such

views as these that, in 1849–50, this institution was wholly reorganized upon the basis of a general polytechnic institute, when it received the distinctive addition to its title, under which it has since been more or less generally known. Its objects were thenceforward declared to be 'The education of architects and civil, mining, and topographical engineers, upon an enlarged basis and with a liberal development of mental and physical culture.'"

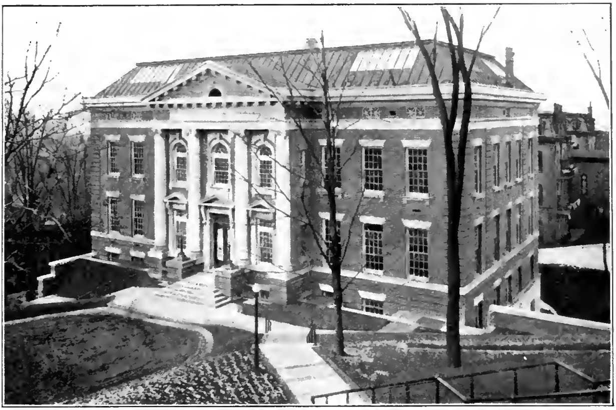
"But it is proper to remark that, with the comprehensive statement and formal announcement then made, of what was proposed to be the future work of the Institute, there was associated in the minds of its managers no immediate expectation of realizing more than a very partial development of their plans, with the comparatively limited resources in *matériel* of every kind at their command. Accordingly it was resolved that, of the entire Institute curriculum, they would at first proceed to develop the General Course—the common scientific basis of the four professional courses—and the two specialties of Civil and Topographical Engineering to as good a degree of excellence as should be practicable under the existing circumstances; while they would defer any attempt to effect the more complete development of their plans, including the important specialties of Architecture and Mining Engineering, to a period when they might hope to be able to invoke effectively the aid of conditions more favorable to realizations so desirable."

As indicated in these extracts, no attempt was made to develop at once all the special technical

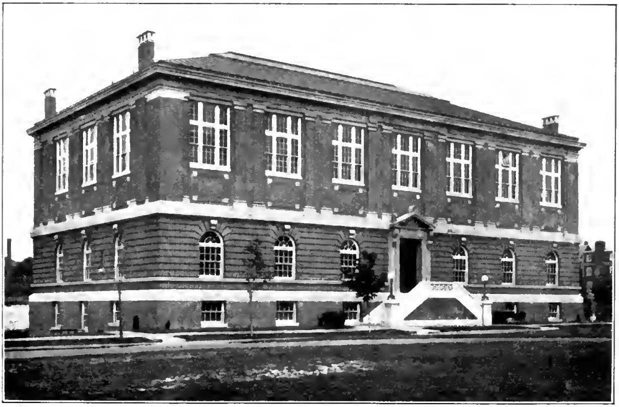
courses which it was intended to establish eventually. The course in Natural Science was made two years in length and that in Civil Engineering required three years. The first year was common to both. The degree given for the former course was Bachelor of Science, B.S., and for the latter Civil Engineer, C.E. The highest or senior class was called Division A and the others Divisions B and C. In 1852 a "preparatory class," in which students were fitted to enter Division C, was inaugurated.

An examination of the new curriculum shows the effect upon its formation of the study of the French scientific schools. Its object was practically that of L'École Centrale des Arts et Manufactures, which, in a three-years' course, was intended to train civil engineers, directors of works, superintendents of manufactories, professors of applied science, etc., and the reorganized course bears considerable resemblance to that of the same school. That part of it which forms the groundwork for the higher technical studies also resembles the curriculum of L'École Polytechnique, which, it will be remembered, does not furnish a complete system of instruction, but has for its object the preparation of students for entrance to certain government technical institutions.

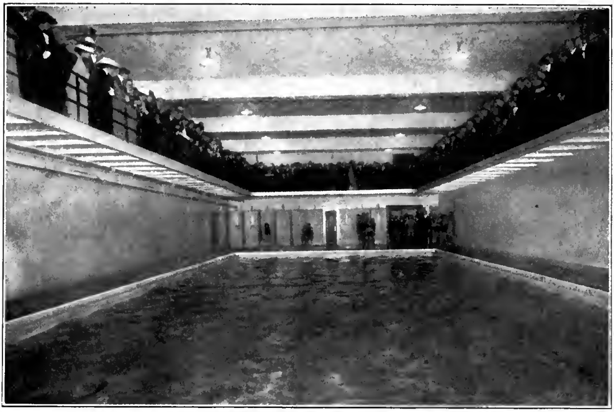
It was the intention to obtain, as far as the conditions would admit, the same end here in a single school that was obtained in France from L'École Polytechnique and the special schools combined. As a matter of fact, with the same high



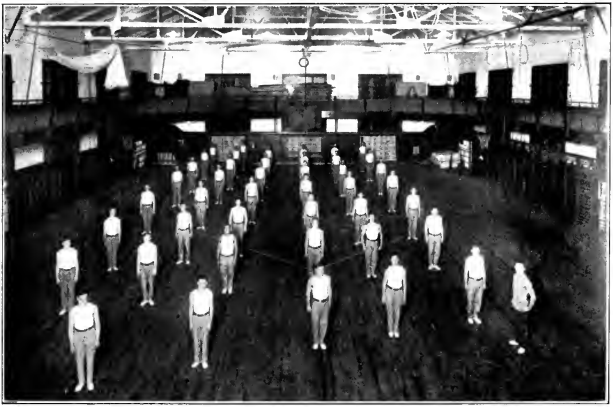
Pittsburgh Building, 1912–



'87 Gymnasium, 1913–



'87 Gymnasium. Swimming Pool



'87 Gymnasium. Main Floor

aim in view, the curriculums of such institutions, wherever situated, must necessarily bear a resemblance to each other. In relation to this subject the circular of February, 1851, informs us that "In the essential features of its design and intentions, the Institute may be said to occupy a position between L'École Polytechnique and L'École Centrale des Arts et Manufactures, of Paris. It claims no other resemblance to these celebrated and *richly endowed* institutions. To its peculiar mode of study *there is no known counterpart.*"

The mode of study at this time contained the essential features of that which characterized the beginnings of the school. The students took full notes of the lectures delivered by the professors and afterwards studied the subjects by the aid of their notes, their own practical exercises, and books of reference. The next day they were interrogated by the instructors and after the interrogation were divided into small sections which assembled in different rooms. Each student then delivered an extemporaneous lecture upon the subject under consideration, which was afterwards criticised by the other members of his section and by an officer styled a "Repeater," who, under the direction of the professor at the head of the department, took charge of the several sections.

The Repeaters were generally resident graduates or students who were members of the highest class in the institution. The term seems to have been taken from the name *Répétiteur*, given in L'École Centrale to a class of instructors with similar

duties. It was used only a few years and appears for the last time in the catalogue of 1859, in which, among twelve instructors, there is found only one, the Repeater of Mechanics, who was at the same time assistant Professor of Mathematics. In that of 1855, among eleven instructors there is no repeater. The practice of requiring daily lectures from each student was gradually dropped with the use of this title, and the present method of strict interrogations and of blackboard demonstrations which partake of the nature of the lectures, was as gradually introduced. This change was largely and almost necessarily the result of the increased attendance at the school.

The "Notices" of 1835 and the examination questions of the succeeding year, together with the qualifications required of candidates for degrees in 1838 and 1839, all of which are found in the preceding chapter and Appendix I., give a reasonable knowledge of the character of the work done at that period of the school's history. As it is now proposed to set forth the curriculum after the reorganization, it will be well to preface it with the remark that, although the limited time given to the course naturally restricted its value, gradual improvements had been made in the intermediate years, as required by the advances in natural and applied science. In fact, the reorganization itself was not immediately completed. Although it may be said to have taken place in 1849–50, and the courses were extended at this time, a departure, in most respects so decided, from its previous methods

necessarily could not be immediately accomplished. By the year 1854 the courses in Civil Engineering and Natural Science had been well developed. The curriculums of these courses, taken from the Annual Register of that year, give outlines of the subjects studied and the order of their distribution. They will be found in Appendix II.

In the curriculums, the use of the term "The Course" after a subject refers to a detailed description of it in an exhaustive schedule in the Register. This gives in minute detail the scope of each subject taught and the text-books and works of reference used. It covers forty pages, containing thirty-one main and two hundred and two subdivisions.

Lectures and text-books were both used in most of the courses. Among the text-books may be mentioned: Davies' Legendre's Geometry, Davies' Bourdon's Algebra, Chauvenet's Trigonometry, Church's Analytical Geometry, Church's Calculus, Mahan's Industrial Drawing, Davies' Shades, Shadows, and Perspective; Davies' Descriptive Geometry, Jopling's Isometrical Perspective, Davies' Surveying, Simms' Mathematical Instruments, Gummere's Astronomy, Hitchcock's Geology, Dana's Mineralogy, Gray's Botany, Gregory's Elements of Chemistry, Mill's Qualitative Analysis, Fresenius' Quantitative Analysis, Morfit's Chemical Manipulation, Bird's Natural Philosophy, Bartlett's Acoustics and Optics, Bartlett's Analytical Mechanics, Weisbach's Mechanics of Machinery and Engineering, Pambour's Theory of the Steam

Engine, Moseley's Mechanical Principles of Engineering and Architecture, Morin's Aide-Mémoire de Mecanique Pratique, Haupt's Bridge Construction, Mahan's Civil Engineering, and D'Aubuisson's Traité d'Hydraulique. A list of one hundred and twenty-nine works of reference in English, French, and German is also given.

The practical part of the work of the school included surveys, chemical and physical laboratory work, botanical and geological excursions, visits to factories, etc.

Applicants for admission were required to be at least sixteen years old. The majority were over eighteen. They were required to be well prepared in geography, English composition, arithmetic, including the metric system; plane geometry, and algebra to equations of the second degree.

The first "Register" to appear after the reorganization was a pamphlet of sixteen pages dated August 15, 1851. The second, which was published in October, 1852, contained after the names of the students their grades in the different departments and their class standing. After some of them the letters "d" and "a," meaning respectively "deficient" and "not examined," were placed. To this there was decided objection on the part of the students, who republished this register in December of the same year, leaving out the objectionable features. The grades were in consequence omitted from succeeding registers, though the "order in general standing" upon graduation was published until 1855, since which year all names of under-

graduates have appeared in alphabetical order in the different divisions.

About this time students were advised to wear a "uniform dress," and many of them did so. The suit, including a cap, was made of dark-green cloth. The coat was a single-breasted frock with a black velvet collar, and the cap had an ornamental symbol in gold placed on the band in front. The custom did not continue very long, and the uniform was officially mentioned for the last time in the Register of 1855.

Shortly after the extension of the course of study the name of the school was changed from the Rensselaer Institute to the Rensselaer Polytechnic Institute. In a "Programme" issued in 1851 it is called by its former name, but in the Register published in August of the same year the latter title is used. Although henceforth known as the Rensselaer Polytechnic Institute, the change was not ratified by act of Legislature until April 8, 1861. The name "Annual Register" was first given to the official catalogue in 1854.

The improvement of the curriculum was followed by an increase in the number of students and instructors. The report to the Regents of the University of the State, made in 1848, shows that on September 29 of that year there were twenty-two students, and that during the year ending on that date there had been a total attendance of fifty-one. The number of instructors was five, including the president, who lectured once a week on Mental and Moral Philosophy. In 1855 there were one hun-

dred and fourteen students, of whom fifty-one were from the State of New York, forty-eight from fourteen other States, including Maine, Louisiana and California, and fifteen from foreign countries. The number of instructors had increased to eleven, including Dr. Beman. In consequence of the extension of the course no class was graduated in 1852.

In 1848 the tuition was $20 for each term of five months, or $40 a year. Those who worked in the chemical laboratory paid $8 a term more. In 1851 the corresponding fees were $60 a year and $5 a term. In 1857 the tuition was $100 a year, with no extra charges. This was increased to $150 a year in 1864 and again in 1866 to $200, at which price it remained until 1912, when, after the erection of the '87 gymnasium, it was increased to $205 a year.

The fifth act, relating to the institution, passed by the Legislature of the State was dated March 8, 1850. Besides creating the office of Director this law reorganized the board of trustees. It was enlarged to nineteen members, and the only *ex-officio* member left in it was the Mayor of Troy. All restrictions as to place of residence of members were abolished. The act of April 8, 1861, which legalized the change of name of the Institute made ten years before and consolidated the several previous laws relating to it, also gave the board power to increase its number to twenty-five members, including the Mayor of Troy. No further change has since been made in this number. By the same law the Trustees were given the power to confer the degree of

Civil Engineer, Topographical Engineer, Bachelor of Science, and such other academic honors as they might see fit. This was merely a more explicit definition of their power to grant certificates than was given by the act of 1835, under which they had been annually conferring degrees. The act of 1861 was amended by a law passed March 26, 1866. Only two sections were amended, one by leaving out a clause that three days' notice of a Trustee meeting must be given and the other by adding a clause to the effect that any member of the Board of Trustees failing to attend meetings for a year could be dropped by the Board. Two other sections relating to the appointment and removal of instructors and the duties of the Director were changed by an act dated May 4, 1887. The next act passed was dated April 22, 1898. It relates to the admission of students and the conferring of degrees, and reads as follows: "The Rensselaer Polytechnic Institute shall have exclusive power to regulate and prescribe the terms of admission of students to the courses of instruction prescribed from time to time to candidates for its degrees, and on the satisfactory completion of such courses of study to confer degrees as authorized by Chapter one hundred and fifty-one of the laws of eighteen hundred and sixty-one and the several laws amendatory thereof and to award suitable diplomas or certificates thereof."

In pursuance of the plan outlined at the time of the reorganization a course in Topographical Engineering was, in 1857, added to those already

existing. Upon its satisfactory completion the candidate received the degree of Topographical Engineer, T.E. Like the course in Natural, or, as it was then called, General Science, it was two years in length, while that in Civil Engineering required three years. A special course in Land Surveying, only one year in duration, was also inaugurated. The first year of the Topographical curriculum was identical with that in Civil Engineering. In the second year pure mathematics, graphics, physics, chemistry, and geology were taught, and especial attention was given to general surveying, practical astronomy and topographical drawing.

It will be remembered, in considering the time given to the three principal courses, that the preparatory class increased their length for some of the students by a period of one year. Since the first year of its establishment its members had varied in number from twenty-two to thirty-two. They were treated as members of the Institute, and their names were printed in the Register, after Division C, under the heading "Preparatory Class." In 1858 "Division D" was prefixed to this title, and after 1862 it was no longer called the preparatory class but simply "Division D."

In 1860 the special course in Land Surveying was abolished and the courses in General Science and Topographical Engineering were made three years in length, the same as that in Civil Engineering. In 1862, when the preparatory class became Division D, the latter course was made four years in length and the two former each three years.

These two, however, began with Division C, the course in Topographical Engineering being identical with that in Civil Engineering, throughout the work of divisions C and B, and the course in General Science coinciding with both of the engineering courses in Division C.

At this time candidates for admission to Division D were required to be not less than fifteen years old, and they were examined in geography, English grammar, arithmetic, and algebra (through equations of the first degree).

During the scholastic year 1862–3 still other changes were made, a course in Mechanical Engineering was added, and each of the four courses was made four years in length, the first two years being identical in all. The last two years in Mechanical Engineering contained, of course, more of the theory and practice of machine construction than those leading to the other two professional degrees. This course seems to have been one on paper only and there is no evidence that any student ever took it. Certainly no one was graduated with this degree at that time. For this reason the curriculum is not published in the Appendix with the others. It was last printed in the catalogue of July, 1870. During these eight years there were no professor of Mechanical Engineering and no assistant. Courses in Structures and Hydraulics were more largely developed in the Civil Engineering curriculum and Geodesy and General Surveying in that of Topographical Engineering. The improvements in these various courses, made an-

nually during the preceding years, are given in detail in the Annual Registers.

In 1866 the course in Topographical Engineering was replaced by one in Mining Engineering. The number of students in the former had never been great, and of these only five had been graduated, all in the class of 1860. The first two years in Mining Engineering were identical with those of the other courses. The distribution of the subjects in the last two years is given in Appendix II.

In July, 1859, B. Franklin Greene severed his connection with the Institute, after a service of more than twelve years. At first Senior Professor with the chair of Mathematics and Physics, his title was changed in 1850 to Director and Professor of Physics, Chemistry and Geology. In 1852 he became Professor of Physics, Mechanics and Constructive Engineering, and in 1855 Professor of Mechanics, Machines and Constructions. The change in the character of the course while he was at the head of the faculty gives evidence of his efficiency and great ability.

Ever since he had been elected Vice-president in 1841, Rev. Dr. Beman had delivered lectures on Mental and Moral Philosophy at the Institute, and since 1854 he had been Professor of Mental Philosophy as well as President of the Board of Trustees. Upon the resignation of B. Franklin Greene he was made Director as well, and the title of Senior Professor was revived and conferred upon Charles Drowne, who became at the same time Professor of Civil Engineering. Professor Drowne

was graduated in the class of 1847 with the degree of Civil Engineer, and in the same year became Assistant in Mathematics and Physics. In 1850 he was Adjunct Professor of Theoretical and Practical Mechanics, and from 1851 to 1855 Professor of Mathematics, Astronomy and Geodesy. Dr. Beman remained Director only one year, and in 1860 Charles Drowne became Director and Professor of Theoretical and Practical Mechanics. The term Senior Professor was then dropped and has not since been used.

Although resigning as Director, Dr. Beman continued President of the Board of Trustees until advancing years compelled him to terminate, in 1865, his long and useful connection with it. He was succeeded, March 20, 1865, by John F. Winslow, one of the proprietors of the Rensselaer Iron Works of Troy. He had been a trustee since 1860. Mr. Winslow retained his position only three years; his removal to Poughkeepsie causing him to resign April 9, 1868. On May 7 of the same year the sixth President, Dr. Thomas C. Brinsmade, was elected. He was a physician of Troy who had been a trustee for twenty-four years, having been elected March 4, 1844, during the second occupation of the Old Bank Place. His term of office was short. Whilst reading a paper on the condition of the Institute at a public meeting, held in the evening of June 22, 1868, for the purpose of raising funds for the school, he died suddenly of heart disease. James Forsyth, a lawyer of Troy, was made President December 15, 1868. He had not previously been connected with the institution.

CHAPTER VIII

DESTRUCTION BY FIRES. MORE LAND AND NEW BUILDINGS. ATHLETICS

A GREAT fire which swept over many blocks and destroyed property valued at nearly three millions of dollars occurred in the city on May 10, 1862. It burned the buildings of the Institute, which, besides the two already described, included one adjacent to them, obtained shortly before the fire for a mineralogical and geological museum. The furniture, geological specimens and a part of the chemical apparatus were also destroyed, though a portion of the apparatus and the library were saved.

Temporary quarters were immediately obtained in the University Building on the hill, now called the Provincial Seminary, and the course was resumed on the following Wednesday. Accommodations for the next year were secured in the Vail Building, on the northeast corner of Congress and River streets; and the school remained there until the completion, in May, 1864, of the structure on Eighth Street, at the head of Broadway, which, under the name of the Main Building, was used for purposes of instruction until it in turn was destroyed by fire, June 9, 1904. It was built of brick, and was one hundred and fifteen feet long by fifty feet wide, with a central portion five stories in

height and two wings, each of four stories. The land upon which it was situated, as well as that occupied by the Winslow Laboratory, now called the Shop, was given by Joseph M. Warren, who had been a trustee of the school since 1849. The building was situated on the site of the existing granite approach between Eighth Street and the alley west of it.

The construction of a chemical laboratory was begun in 1865 on that part of the grounds north of the Main Building. It was named the Winslow Laboratory, in honor of President John F. Winslow. He had always been deeply interested in the prosperity of the school, and had contributed largely toward the construction of the Main Building. The laboratory, which was completed during the summer of 1866, was built of brick and was sixty feet long by forty feet wide and three stories in height. This building was three times partially destroyed by fire. Once, on August 27, 1884, when the upper story was burned together with much apparatus and a library of a thousand volumes; again on October 29, 1902, when the loss was about $6,000; and once more on May 5, 1904, at which time the loss was about the same. After the first fire the building was improved and enlarged, and after the fire of 1902 a south wing was added, the repairs and additions costing $10,500. The structure was thus made ninety feet in length. It was continued in use as a chemical laboratory until 1907, when it was converted into a shop for the instruction of students in the Mechanical and Electrical Engineering

courses. The forge shop and foundry are in the basement. The machine shop is on the first floor, and the pattern shop on the third floor. The estimated cost of the building is $37,000 and the value of the machinery contained in it about $20,000.

In 1871 it was determined to improve the course in Civil Engineering and concentrate the efforts of the school upon it. The three courses in Natural Science, Mechanical Engineering and Mining Engineering were, therefore, abolished. The number of students taking the first two had been small, and, although more had taken the last, between the years 1868 and 1871 only twenty-three had been graduated with the degree of Mining Engineer. No one was graduated with the degree of Mechanical Engineer. Metallurgy and free-hand drawing were added to the civil engineering curriculum, and the courses in chemistry, physics and geology as well as those in a number of the practical engineering subjects, were extended and improved. In the course as developed a wide significance was given to the term civil engineering, as is shown by the inclusion in the courses of such subjects as metallurgy, thermodynamics, the theory and construction of engines and other machines, etc.

There was at this time, as there always has been, a considerable number of students who took special courses and were not candidates for a degree. After a lapse of fourteen years the course in Natural Science was re-established at a meeting of the

trustees held September 23, 1885, and still continues a department of instruction at the Institute though its name was changed to the course in General Science in 1909.

The semi-centennial celebration of the foundation of the school was held at Troy, June 14 to 18, 1874. Besides the usual commencement exercises there was a largely attended alumni meeting, three days in duration, at which historical and other addresses pertinent to the occasion were made by the President, graduates, professors, and others. A monument to Amos Eaton, which had recently been placed in Oakwood Cemetery, was dedicated, and sketches were given of the lives of five graduates and students who had served in the civil war and for whom memorial windows had recently been placed in the Main Building. These were Major James Cromwell, C.E., Colonel Charles Osborn Gray, Major Otis Fisher, Lieutenant Henry W. Merian, C.E., and Major Albert Metcalf Harper, C.E. Shortly after the meeting a sixth window, to the memory of Captain James R. Percy, C.E., was added. These six memorials, however, did not represent all of the graduates and students who had been in the war. More than seventy-five had served in the army and navy of the United States, in various capacities, during that period.

In 1874 memorial windows to Amos Eaton and to Professors John Wright and William Elderhorst were also placed in the assembly hall of the Main Building. Professor Wright had held the chair of Botany and Zoology from 1838 to 1845, and Wil-

liam Elderhorst had been Professor of Chemistry from 1855 to 1861.

A leave of absence was granted Professor Drowne, in November, 1875, on account of ill health. He did not recover sufficiently to enable him to return, but resigned December 9, 1876, on which date William L. Adams was appointed Director. President Forsyth had been acting in this capacity from December 11, 1875, until the appointment of Professor Adams who was a graduate of the class of 1862. After some experience in the field he became Acting Professor of Geodesy, Road Engineering and Topographical Drawing from September, 1864, to February, 1865, when he resumed the active practice of his profession. In September, 1872, he returned to the Institute to take charge of the department in which he had previously been Acting Professor. He again left, in 1878, to return to the profession of railroad engineering, and on September 10 of the same year David M. Greene, of the class of 1851, was elected Director. Professor Greene had been for a short time after his graduation Assistant in Mechanics and Physics at the Institute, and had occupied the chair of Geodesy and Topographical Drawing from 1855 to 1861.

The third building to be erected for purposes of instruction was an astronomical observatory which was finished in 1878 at a cost of $15,000. It was presented by Mr. and Mrs. Ebenezer Proudfit of Troy as a memorial to their son, Williams Proudfit, a bright and promising student of the class of 1877,

View South of Walker Laboratory

View on Main Roadway

View West of Club House

View Southeast of Pittsburgh Building

who was, in 1875, fatally injured by being thrown from his carriage. The trustees received a letter from the donors November 6, 1875, in which they signified their intention to erect the observatory. In consequence, a suitable site was found in the Ranken property, situated on the east side of Eighth Street, nearly opposite to the Winslow laboratory. This was bought by the Board January 25, 1877. It had a frontage of one hundred and fifty feet on Eighth Street and extended eastward about five hundred feet to the brow of a hill which has an elevation of about two hundred feet above the Hudson River. It is now merged into the larger plot, south of it, since bought by the school. The property included a dwelling-house and stable, both built of brick. The house, known as the Ranken House, forty feet square and two stories in height, was used for a long time for recitation rooms for the department of Mechanics, and contained the first machine for testing materials of engineering owned by the Institute. It was an Olsen machine, and had a capacity of 50,000 pounds. There was also a Fairbanks cement-testing machine. The house and barn were both removed in 1910 when the Pittsburgh Building was erected. The site of the latter building partly covers that of the Ranken House.

The Williams Proudfit Observatory was built of brick with stone trimmings on the brow of the hill. It consists of a central part thirty feet square, with three wings, the total length being seventy-six feet and breadth sixty feet. The main part

was two stories high, with a dome twenty-nine feet in diameter, under which was the main pier intended for an equatorial telescope. The wings were each one story in height, that to the east containing the transit instrument and other apparatus used for astronomical purposes.

No large telescope was placed under the dome and the observatory was never of great benefit to the Institute, so that when, at the meeting of the Alumni Association held in Troy, in June, 1899, a fund was begun for the erection of an electrical and testing laboratory, Mrs. Proudfit gave $6,500 to change the observatory into a building suitable for such a purpose. Accordingly, in 1900, the three wings were each made two stories in height, the dome was replaced by an ordinary roof, and a two-story building resulted. The Westinghouse Electric and Manufacturing Company and the General Electric Company, together, gave about six thousand dollars' worth of electrical machinery, and J. J. Albright, of the class of '68, gave $2,500 and also $1,500 a year for five years to help maintain the laboratory. The Alumni also raised $36,000 as an endowment fund. The building was partially destroyed by fire December 17, 1902. The insurance obtained on building and apparatus amounted to $13,300. Advantage was taken of this fire to put, in 1903, a third story on the structure and deepen the basement, so that it now has four useful stories. At the same time a boiler-house, containing two seventy-five horse-power boilers and a steam turbine for experimental pur-

poses, was added at the north end. Its roof was on the level of the second story of the building. The improvements cost about $20,000.

By 1904 the number of students had become so large that it was decided to enlarge the laboratory by the addition of two stories to the boiler-house, thus making it of the same height as the other parts of the building. This improvement was completed early in 1905 at a cost of about $4,000. After the change in 1900 all the building, except two rooms, was devoted to electrical work. The electrical laboratories contained direct and alternating current motors and generators, rotary converters and transformers altogether numbering fifteen, as well as other instruments and apparatus necessary for well-equipped laboratories. The remaining two rooms were used for laboratories for the tests of materials of engineering. The first floor of the east wing contained a testing machine of 300,000 pounds capacity, one of 100,000 pounds, one of 50,000 pounds, and one of 10,000 pounds for testing wire. The second floor of the north wing was equipped as a cement-testing laboratory.

When the boiler-house, described hereafter, was finished in 1908, the boilers were taken from the Proudfit Laboratory and the space formerly occupied by them was converted into janitors' quarters. The electrical laboratories were also removed to the Russell Sage Laboratory in 1909 and the entire building was then given over to the Department of Rational and Technical Mechanics. The equipment of this department was then materially

increased by the addition of a 1,200,000-pound machine for compressive tests, an automatic and autographic machine of 150,000 pounds capacity, a torsional machine of 125,000 inch-pounds, and machines for testing paving brick, road metal, cement, and other materials. A very completely equipped cement-testing laboratory was also installed. The building now contains eighteen rooms used for laboratories, lecture and recitation rooms and offices. The 600,000-pound testing-machine in the Russell Sage Laboratory also forms a part of the equipment of the same department.

During the Alumni meeting held at Troy in June, 1881, a committee of graduates was appointed to solicit funds for the endowment of the institution. Francis Collingwood, '55, was made chairman. This action was approved at the meeting held in New York City in January, 1882, and was officially sanctioned by the board of trustees, February 24, 1882. On this date the board appointed James P. Wallace, '37; E. Thompson Gale, '37, and Charles Macdonald, '57, as a committee to receive and manage the funds. About $22,000 was raised, after which the work was interfered with by solicitations for subscriptions for the gymnasium. The amount collected was due largely to the efforts of Mr. Collingwood.

The year 1883 is made memorable by the endowment of the chair of Rational and Technical Mechanics; the first to be endowed. Sixty thousand dollars was given for this purpose by Mrs. Mary Elizabeth Hart, as a memorial to her husband,

with the condition that the chair should be designated the William Howard Hart Professorship of Rational and Technical Mechanics. The communication to the board of trustees offering the endowment was dated June 11, 1883. Mr. Hart was the son of Richard P. Hart, who had been a trustee of the school in its earlier days (1825–43). He had always been interested in the school, and in her letter Mrs. Hart informed the board that the endowment was "in furtherance of his views and as a fitting memorial of his interest in the prosperity and success of the Institute."

It has been seen that the geological and mineralogical specimens belonging to the school were destroyed by the fire of 1862. Another collection was immediately begun by H. B. Nason, at that time Professor of Natural History. A thousand dollars was given for this purpose, and by the fall of 1862 more than a thousand specimens of minerals, rocks and fossils had been obtained.

From the time of completion of the Main Building, and for nearly thirty years thereafter, this collection, to which additions were constantly being made, together with the cabinets of natural history, was kept in a large hall on the top floor and the library was in a room on the second floor. The erection of a fire-proof building in which both could be safely kept was urged by Professor Nason at the Alumni meeting in Troy, June 13, 1888. The State Geologist of New York, Professor James Hall, of the class of 1832, had promised to give a valuable collection of fossils if such a building were

provided. Part of the amount required for its construction was raised by subscription from graduates at the meeting, and at the Pittsburgh meeting of the association of graduates held January 31, 1889, enough was pledged to insure its erection. A lot on the east side of Second Street, between State Street and Broadway, immediately north of the Savings Bank Building, was purchased June 2, 1890, with a fund raised by subscription among the trustees, and the building was completed in 1893. The lot cost $10,000 and the building $35,000. Wilson Brothers & Co., of Philadelphia, provided the plans, the three brothers from whom the firm took its name being graduates of the Institute. The structure is fireproof, fifty feet square and three stories in height. The lower portion is faced with brown stone and the upper with yellow brick and terra-cotta. The library, a room for the trustees and the office of the Director were on the first floor, and the other two contained the geological and mineralogical collections which at that time numbered about ten thousand specimens. There was also a lecture room for the department of Geology on the second floor. This building was used until the completion of the Pittsburgh Building in February, 1912, at which time everything was removed from it. It is now vacant and is no longer used for Institute purposes.

In May, 1883, a petition was received by the trustees from the students, who asked that steps be taken by the board to provide a suitable gymnasium for their use. The subject was again agi-

tated later in the year, and in 1884 a lot on the south side of Broadway, at the foot of the property containing the Main Building, was purchased by the trustees. Upon this site a gymnasium of brick, trimmed with stone and terra-cotta, eighty feet long by forty-four feet wide and two stories in height, was erected. It was opened March 11, 1887. The building cost $20,000. About half of this amount was contributed by alumni, trustees, students, and residents of Troy, and the remainder was appropriated from the funds of the institution. The first story contains a reception-room, a dressing-room, shower baths, and bowling alleys, and the second, the main hall, which is about thirty feet high and is fitted with gymnastic apparatus. There is a running track around this hall and at one end a gallery for spectators. This building was used as a gymnasium until the completion of the '87 gymnasium in November, 1912. It is now rented to the Troy Academy.

President Forsyth, who, besides his official duties as President of the Board of Trustees, had lectured on the Law of Contracts since 1873, died August 10, 1886. Upon his death, William Gurley, of the class of 1839, the Vice-president of the board, became Acting President and remained so until his death, January 11, 1887. On June 1 of the same year Albert E. Powers, a banker and manufacturer of Lansingburg, who had been a trustee since 1861, was elected Vice-president and acted as President until May 2, 1888, when John H. Peck, a prominent lawyer of Troy, was elected to that office.

Mr. Peck had been a member of the board of trustees since June 1, 1887. He resigned from the Presidency and from the board of trustees, January 16, 1901.

After a service of thirteen years David M. Greene resigned September 15, 1891, and Professor Dascom Greene, at the head of the department of Mathematics and Astronomy, was appointed temporary Director. He held this position until the election, January 15, 1892, of Palmer C. Ricketts, of the class of 1875, who had been Assistant in Mathematics and Astronomy from that year until 1882 and Assistant Professor in the same department from 1882 until 1885, when he became William Howard Hart Professor of Rational and Technical Mechanics. He is still Director and has been also President of the Board of Trustees since February 13, 1901. The duties incident to these positions compelled him to relinquish most of his work as teacher, and Professor Thomas R. Lawson became Associate Professor and the head of the Department of Mechanics in 1906.

Reference has already been made to the fires which occurred in the Main Building and Chemical Laboratory in 1904. The former was almost completely destroyed and the latter was badly damaged. In consequence of the destruction of the Main Building recitations were held in the Ranken House and in the State Bank Building on the southwest corner of River and Fulton streets, a floor of which was rented for this purpose. This was continued until the Carnegie Building was ready for occupancy in September, 1906.

At a meeting of the board of trustees held December 7, 1904, a committee was appointed to consider the site and kind of building to replace the Main Building. Architects were employed and at a meeting held January 4, 1905, it was resolved to replace it by a new building on or near the old site, and to build a new chemical laboratory on the Ranken property. These plans were changed, however, when the suggestion was made by J. J. Albright, of '68, that the property of Walter P. Warren, adjacent to and south of the Ranken plot, be bought. He offered to give $50,000 toward the erection of a new chemical laboratory if this property were bought. It was finally acquired June 1, 1905, upon the payment of $125,000. It had a frontage of 315 feet on Eighth Street, extending easterly for a distance of 1,300 feet and containing ten and a half acres of land. There were a dwelling house and stable on it, the dwelling being valued at $40,000. During the next two years more land was bought. When the new boiler-house was projected in 1907 the site determined upon for it rendered advisable the purchase of a small piece of land from the Troy Hospital, and in 1907 about 0.81 acre was bought. In the same year 1.41 acres were bought in two parcels from the Warren and Tibbits estates. These two parcels bordered on Fifteenth Street. They were separated from the main plot by land belonging to St. Joseph's Seminary, and 10.6 acres were bought from the Seminary in 1907. The Ranken House property contained 1.7 acres;

so that the total acreage in the plot was 25 and the total cost was $164,620. This included two houses and two stables on the Ranken and Warren properties. A ravine ran east and west through the land, which was very irregular in surface. There were a stream and a pond of considerable size upon it. A fill, of fifteen feet in places, was necessary to make the athletic field. The pond, which was north of the present driveway, was filled by cutting the top off a hill east of the site of the carpenter shop and by removing clay to a depth of ten feet from the rocks about two hundred feet westerly. In 1908 a street, called Avenue B, was cut through the ravine from Ninth to Fifteenth streets. This took 1.37 acres from the plot, leaving 23.67 acres divided into two parts. The main plot, upon which most of the buildings are now situated, has a frontage of 472 feet on Eighth Street, one of 444 feet on Fifteenth Street, and a length of 1,765 feet between the two streets. It contains 19.5 acres. The plot north of Avenue B contains about 4 acres.

Before the purchase of the Warren property was consummated it was known that Mr. Andrew Carnegie was to give us $125,000 for the erection of a building to take the place of the Main Building. This gift was due to the efforts of Captain Robert W. Hunt, who had known Mr. Carnegie for a long time and who had been a trustee of the Institute since 1886. The site chosen for the structure was on the winding road which extends from Eighth Street to the main plateau of the

property. Its center is on the center line of Broadway produced, the front face is about two hundred feet east of the street, and the second story is about on the level of the main campus. The building was finished in September, 1906, at a cost, including grading and sidewalks, of $133,000. It is 60 by 100 feet in plan, with four stories and a basement, and is built of Harvard brick trimmed with Indiana limestone, with concrete and steel floors and partitions. There are fifteen recitation rooms, two drawing-rooms, one of them 60 by 100 feet in size, two lobbies, two study rooms, and quarters for a janitor. The halls have terrazzo floors with walls tiled in white to a distance of seven feet above the floor. The style adopted for this building has, with the exception of the club-house, been continued for all others since constructed. All are constructed of the same kind of brick and stone, though their architectural features vary sufficiently to prevent monotony. The halls in all of them used for purposes of instruction have terrazzo floors tiled, for cleanliness and light, to a distance of seven feet above the floor. They all have floors of concrete or tile and partitions of brick. The lighting is done throughout by electricity and all are heated by steam from a central station. This central station or boiler-house was finished in 1908. It is situated on a low spot in the grounds east of the Proudfit Laboratory and north of the Russell Sage Laboratory, with which it is connected by an underground passageway. The chimney forms a part of the latter laboratory,

the gases from the boilers passing through a horizontal tunnel, between the two buildings, to reach the chimney. There is room for boilers of 800 horse-power, though the capacity at present is only 650. The structure cost $37,000 and the contents are valued at about $9,000. All the buildings on the grounds are heated from this house.

On account of the increase in the number of students, the old chemical laboratory became too small, and in 1905 it was determined to build a larger one. After the purchase of the Warren property it was decided to place it on this property at the same level as the Proudfit Laboratory and between it and the Carnegie Building which was about to be erected.

The new chemical laboratory was built at the same time as the Carnegie Building, and was finished towards the end of 1906 at a cost of $110,000. Of this amount, J. J. Albright, according to his promise, gave $50,000. The architects were Messrs. Lawlor and Haase. Mr. Lawlor was graduated from the Institute in the class of '88. They were also the architects for the Sage Building, the Club-House and the '87 Gymnasium. The laboratory is built of the same materials as the Carnegie Building, though it is somewhat more ornate. It contains a large lecture room, a special chemical library, a qualitative laboratory, 50 by 80 feet in size, capable of holding one hundred and thirty students, four other large laboratories for work in various branches of chemistry, and fifteen other

rooms for private laboratories, offices, recitation rooms and store rooms. As originally built, a large part of the basement was used as an assay room and the lecture room extended from the second floor to the roof. In 1913 much more room for special laboratories was obtained by placing the lecture room on the third floor, and thus gaining one more large room for water analysis, and by dividing up the assay room. These and other improvements cost about $20,000. Shortly after the structure was erected it was decided to name it the William Weightman Walker Laboratory, in memory of Dr. William Weightman Walker, of the class of '86, and in gratitude to the mother of Dr. Walker, who had been a great benefactress to the school.

After the Warren property had been purchased and the determination made to place the Carnegie Building and new chemical laboratory upon it, the question of the disposition of the wreck of the Main Building arose. One suggestion was that it be made into a dormitory. During this period the citizens of Troy had been appealed to for aid to the institution and the Chamber of Commerce had begun to raise money for this purpose. During one of the meetings of the Chamber, Edward F. Murray, of Troy, strongly advocated the appropriation by the City of Troy of a sufficient amount, which he estimated at $50,000, to extend Broadway over the site of the old building to Eighth Street, and to build a series of granite steps on this site, thus forming a handsome approach to the

new buildings of the school from the center of the city. This suggestion was carried out by the municipality and a simple, very handsome granite approach was completed in 1907, at a cost of $40,000. The Institute donated the land for the width of Broadway, and, in order to protect the approach, in 1910 it donated to the city all the land it owned between the alley and Eighth Street south of the approach and for a distance of fifteen feet north of it.

A winding road, about 2,100 feet in length, leads up the hill through the Institute property from Eighth Street to a point in Avenue B about 300 feet west of Fifteenth Street. Altogether there are about 2,900 feet of roadway on the grounds and about 3,600 feet of sidewalks paved with flagstones. The surface of the main campus is about one hundred feet above the sidewalk at Eighth Street at the head of Broadway. Successive flights of granite steps with bronze railings lead from this street to the campus. There are two hundred and thirty-seven such steps on the grounds. The road winds up the hill in front of the Pittsburgh Building, around the Carnegie Building, and in front successively of the Walker Laboratory, Sage Building and the '87 Gymnasium. The Sage Building is on the level of the main campus, and the '87 Gymnasium is situated on the level of the athletic field near the point where the road meets Avenue B. At this end of the road there is a handsome gateway with columns and walls of Harvard brick with limestone trimmings and gates of ornamental iron. It was

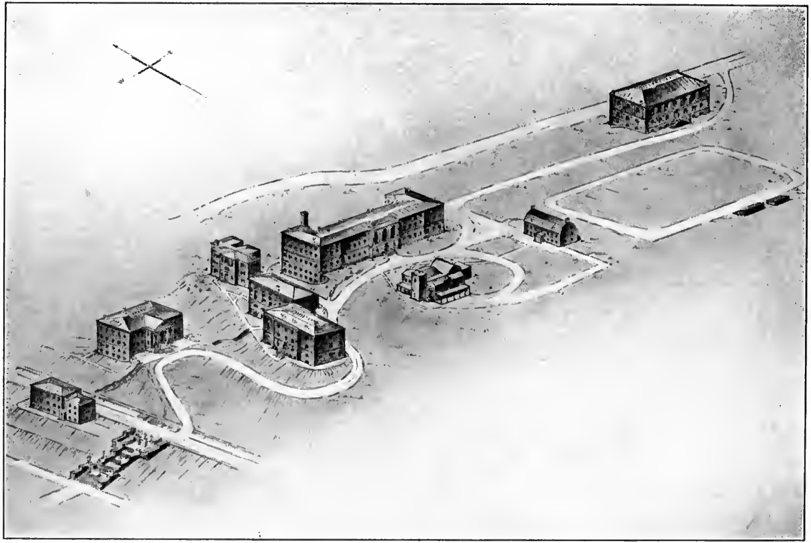
presented by Mrs. C. W. Tillinghast and erected in 1914 at a cost of $4,300.

The dwelling house on the Warren property was of brick and very large. The number of rooms was increased by partitions, and in 1907 it was converted into a dormitory holding about thirty students. The rooms are rented from the Institute by the year. A caterer supplies board and is paid for it directly by the students. The building was never intended for a dormitory for students, and is not satisfactory for this purpose. It is, however, the only dormitory possessed by the school at the present time.

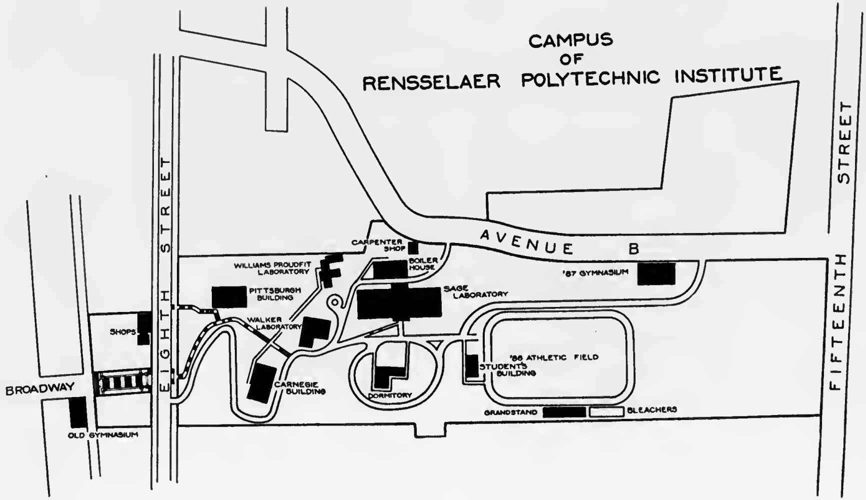
A Young Men's Christian Association was established at the Institute in 1883. This was the third students' Y. M. C. A. to be established in the State. It never was very successful, and each year only a comparatively small number of students were interested in its work. In 1906 a committee of graduates in New York City, composed of Messrs. N. P. Lewis, '79; Henry W. Hodge, '85; M. E. Evans, '95; G. A. Soper, '95; and F. de P. Hone, '97, organized the Rensselaer Students' Association. It was intended to form a well-organized club as a central meeting-place for all students and where all would be welcome. The object was to form a closer bond of union between the students as a whole, without regard to fraternity or other affiliations, than had existed up to that time. It was not intended to make it a Christian Association, though it was intended to have a religious committee among other committees

in charge of matters of interest to students. The Graduate Committee began by raising money to pay the salary of a Secretary of the Association for three years, beginning in 1906. They, at the same time, attempted to collect funds for a club-house, but only succeeded in raising $3,600 for this purpose. In the meantime the trustees had authorized the expenditure of an amount not to exceed $10,000 for the purpose of remodeling the Warren barn or helping to build a new club-house. Plans were at first drawn for remodeling the barn, but it was finally concluded to build a new house. This was completed in the early part of 1908 at a cost, furnished, of about $19,000, of which the Board of Trustees had to pay $15,500. The Club House, situated adjacent to and west of the '86 Athletic Field, is a handsome colonial building of wood with shingled sides and roof. It is 70 feet long, 35 feet wide and three stories in height. The first story contains a billiard room, an office and the editorial room of *The Polytechnic;* the second, an assembly room, a reading room, a pantry and a kitchen; and the third, three bedrooms, two committee rooms, a room for the Press Club, and a storage room. A porch 70 feet long and 10 feet wide overlooks the athletic field.

Up to this time there had been no headquarters for the student activities of the school. Nearly eighteen years before, on October 25, 1890, the Rensselaer Polytechnic Institute Union had been formed for the purpose of encouraging and promoting athletics and other student activities. and



Pittsburgh Building Proudfit Laboratory Sage Laboratory Club House '87 Gymnasium
Shop Walker Laboratory Dormitory '86 Athletic Field
Approach Carnegie Building


CAMPUS
OF
RENSSELAER POLYTECHNIC INSTITUTE
EIGHTH STREET
FIFTEENTH STREET
AVENUE B
BROADWAY
SHOPS
OLD GYMNASIUM
CARPENTER SHOP
WILLIAMS PROUDFIT LABORATORY
BOILER HOUSE
PITTSBURGH BUILDING
SAGE LABORATORY
WALKER LABORATORY
CARNEGIE BUILDING
DORMITORY
'87 GYMNASIUM
'86 ATHLETIC FIELD
STUDENTS BUILDING
GRANDSTAND
BLEACHERS

it had been in existence ever since. The relation of the R. P. I. Union to the new Rensselaer Students' Association had now to be seriously considered. The absorption of the Union by the Association resulted in 1908, and the combined organizations took the name of the Rensselaer Union.

According to the constitution of the Union its object is "to unite all students in a common desire to promote loyalty toward the Institute; to stand for high character, truth and justice; to build for true manhood by every form of individual and organized effort; to increase the percentage of graduates; and to provide an effective means of furthering the social life of the Institute and all lines of student activities." It is governed by an Executive Committee composed of the President of the Union, the Grand Marshal, the Treasurer, the Financial Secretary, the Recording Secretary, the Chairman of the Athletic Committee, the Business Manager of *The Polytechnic*, the Manager of the Glee Club and a member of the Faculty chosen by the Prudential Committee of the Board of Trustees. All members of the Committee, except the Faculty Member and the Treasurer, who is the Treasurer of the Institute, are students.

The President and Grand Marshal are both elected from Division B at the end of the scholastic year. The President is the presiding officer of the Union and Chairman of the Executive Committee. The Grand Marshal is regarded as the leader of the student body. He has jurisdiction over all inter-

class contests, and is an *ex-officio* member of all standing committees of the Union. The first one was elected from the class of 1866, and there has been one for each succeeding class except those from 1891 to 1894, inclusive. The names of all of them are given in Appendix III.

The Executive Committee has control, under direction of the Board of Trustees of the Institute, not only of the club-house but of the '86 athletic field, the athletic games and the student activities generally. In 1912 it took *The Polytechnic* under its charge. At first an annual fee of five dollars was charged for membership in the Union, and although all students had the right to use the athletic field, only those who paid this fee were permitted to use the club-house and vote for the Grand Marshal and other officers of the Union. This was continued until the erection of the '87 gymnasium, when the tuition fee was increased by five dollars a year for all students and all became members of the Union without any other payment. At present there are ten standing committees: the House, Athletic, Religious Work, Hop, Judgment, *The Polytechnic*, Book, and Nominating, and the Committees on Co-operation and Musical Clubs.

The Union now has control of the football, baseball, basketball, hockey and track teams, the Glee and Mandolin Clubs, the Orchestra and the Band, the Union Hops, *The Polytechnic*, the Students' Handbook, the Press Club, and the Book Committee.

An idea of the operations of the Union may be obtained from a consideration of the sources of its income for the year 1913–14. The income was $14,706.65, obtained from the following sources: Students' Handbook, $126.75; *The Polytechnic*, $1,500.00; Football, $1,966.40; Basketball, $1,180.00; Hockey, $296.45; Baseball, $650.00; Track, $300.00; Union Hops, $175.00; Pool and Billiards, $650.00; and sale of text-books, $8,000.00. The sale of text-books results from the work of the Book Committee, which sells text-books to students for cash at a considerable reduction from the list price of publishers or the prices of retail dealers in the city.

The formation of the Rensselaer Union has had a very beneficial effect upon athletics at the Institute. The various branches have been placed upon a much more businesslike basis. In order, however, to prevent some of the students from neglecting their work in order to play on the teams, an Athletic Committee of the Faculty was appointed in 1909 and rules were inaugurated and are enforced which prevent students in poor standing from taking part in intercollegiate games.

There has been an Institute baseball team since 1885. Ten games are arranged each year with teams of near-by institutions. The class teams also play among themselves and have an annual contest for a silver cup. The football team has a schedule of ten games and the basketball team one of about twenty. No definite number is played by the hockey team, for which an outside rink is pro-

vided on the Institute property north of Avenue B. The track team has annually three dual meets with teams of other institutions, and there is also an interclass meet, after which the winning class has its numerals engraved upon the Robb cup, and the winner of the greatest number of points has his mane placed on the Seymour cup. Each member of the Institute baseball, football, basketball or hockey team who has taken part in a certain number of intercollegiate games, or of the track team who has scored a certain number of points in an intercollegiate meet, as well as the managers of the teams and the Grand Marshal and President of the Rensselaer Union, have the right to wear a sweater with the letter R upon it; the form of the letter being different for different teams. Under certain conditions the right to wear class numerals is conferred upon some of the students taking part in interclass games. The right to wear letters and numerals is jealously guarded. The track and field records made on the Institute field by Institute students follow:

100 Yard Dash—Trow '16—10 sec., May 9, 1914.
440 Yard Run—Gifford '06—53 sec., May 30, 1903.
120 Yard High Hurdle—Waters '11—16 2-5 sec., May 9, 1908.
1 Mile Run—Scrafford '09—4 min. 44 4-5 sec., May 16, 1908.
220 Yard Low Hurdle—Waters '11—26 3-5 sec., May 16, 1908.
880 Yard Run—Scrafford '09—2 min. 5 3-5 sec., May 25, 1907.
220 Yard Dash—Torney '10—22 4-5 sec., May 25, 1907.
2 Mile Run—Osgood '13—10 min. 24 3-5 sec., May 7, 1910.
Pole Vault—Lippett '11—10' 6", May 16, 1908.

Shot Put—Cox '11—38′ 7″, May 9, 1908.
High Jump—Williams '12—5′ 6 1-2″, May 14, 1910.
Hammer Throw—Howland '12—111′ 6″, May 7, 1910.
Broad Jump—Trow '16—23′ 2″, May 23, 1914.
Discus Throw—Magor '12—107′ 0″, May 7, 1910.

CHAPTER IX

RUSSELL SAGE. MECHANICAL AND ELECTRICAL COURSES. GRADUATE COURSES. '87 GYMNASIUM

Mr. Russell Sage, a well-known financier of New York City, was elected a Trustee of the Institute June 24, 1896. He died July 22, 1906. In November of the same year the writer had an interview with Mr. Robert W. DeForest, the counselor and confidential adviser of Mrs. Sage, during which he asked for a donation of $1,000,000 to establish a Russell Sage School of Mechanical Engineering. Later in the month he had an interview with Mrs. Sage, and afterwards received a letter dated January 21, 1907, which reads as follows:

"Dear Mr. Ricketts:

"I have told you of my intention to give one million dollars to the Troy Polytechnic, and I know, from my conversation with you and from what Mr. Robert W. DeForest has reported to me of his interview with you, the general purposes for which you intend to use it.

"I will immediately send you my check for $100,000. If it does not accompany this letter it will follow it, and I shall be ready to pay the balance upon your request whenever it may be needed, at any time after May 1st, 1907.

"I write this letter so as to make my gift, to which I attach no conditions, a personal obligation upon me, and in the event of my death before consummating it, upon my estate. It is right that you should have such a letter before you begin to make your plans.

"I am quite willing that this gift should be announced pursuant to your desire, at the meeting of your Trustees and of your Alumni, to be held, as I understand, some ten days hence, and to leave the form of announcement to you, except that in making the announcement I should like to have the fact of my own and Mr. Sage's previous relations to and interest in the Polytechnic made apparent, as a reason for the gift, and as differentiating the Polytechnic from other institutions who have made applications to which I have not responded, and with which neither Mr. Sage nor myself had any personal or official relations.

"Sincerely yours,

"MARGARET OLIVIA SAGE."

A check for $100,000 was enclosed with the letter, and the remainder of the million dollars was given later in the year.

Both Mr. and Mrs. Sage had been interested in Troy institutions for many years. Mrs. Sage was graduated at the Emma Willard School, and Mr. Sage's nephew, Russell Sage, 2d, was graduated at the Institute in the class of 1859. A considerable part of Mr. Sage's life was spent in Troy. His early business experience was obtained here. He

was elected to the United States House of Representatives from this district and served two terms, from 1854 to 1858. In 1863 he moved to New York City and began the business career which afterwards placed him amongst the great financiers of the country.

During the last part of the year 1906, the advisability of the establishment of schools of mechanical and electrical engineering had been thoroughly discussed by graduates, faculty, and trustees. There was a diversity of opinion among the graduates, a considerable number of them maintaining that, as the Institute had been a school of civil engineering for such a long time and had made its name as a school of civil engineering, it should remain so; that its course should be broadened and that no specialization should be permitted. They declared that civil engineering covered all branches of engineering other than military and that graduates of the Institute were fully equipped to begin the practice of their profession in any branch. This did not agree with the practice of other schools. In fact, as has been recorded in this history, three engineering courses other than civil had once been established in this school, but they had been discontinued on account of want of funds. The truth is that the field of engineering had been broadening very rapidly and that it was not possible to give in one course four, or even five years in duration, all the fundamental principles necessary to equip a student to begin the intelligent practice of his profession in civil or mechani-

cal or electrical engineering as he might choose. In order to include all the subjects in the four engineering courses given here at the present time (1914) it would be necessary for a student to remain in the Institute between eight and nine years.

After a careful consideration of this question the Faculty, at a meeting held January 26, 1907, unanimously passed the following set of resolutions:

Resolved, That in the opinion of this faculty the establishment of schools of Mechanical and Electrical Engineering would be advisable and would be of great benefit to the school, provided the Board of Trustees have at their disposal sufficient money to properly inaugurate such schools.

Resolved, That in the opinion of the faculty the usefulness of the school would be enlarged if it were a true polytechnic institute and not as at present practically only a school of Civil Engineering.

Resolved, That we believe the establishment of well-equipped schools of Mechanical and Electrical Engineering would be a long step towards changing the school into a true polytechnic institute; and

Resolved, That in passing these resolutions it is the opinion of the faculty that such schools, if established, should be quite similar in character to the school of Civil Engineering at present existing; that they should decidedly not be only special schools either of Mechanical or Electrical Engineering, but that they should be general schools of

Engineering similar to the existing school of Civil Engineering, but with some of the Civil Engineering subjects replaced in each by others more necessary for the education of a Mechanical or an Electrical Engineer.

On February 6, 1907, the Board of Trustees held a meeting at which resolutions of thanks to Mrs. Sage were passed, and at which the Faculty was directed "to submit to the Board an outline of the scheme proposed, giving such information as is obtainable regarding the courses of instruction and number of new professors necessary." And at a meeting on March 14, the Board, after considerable discussion,

Resolved, That courses in Mechanical and Electrical Engineering, leading to the degrees of Mechanical and Electrical Engineer, be established at the Institute, and that a committee consisting of the Prudential Committee, Vice President, and Treasurer of the Board be appointed with power to do whatever may be necessary to inaugurate such courses.

The course in Civil Engineering at the Institute had been, ever since the reorganization in 1849–50, a very general one. The fundamental principles of all branches of engineering had been taught in it; as much as had been possible in a course four years in duration. The courses in Mechanical and Electrical Engineering established by this resolution of the Board were each also four years in length and were likewise very general in their character. The first two years in all were nearly iden-

tical, the principles of all were taught in each, and the greatest divergence took place in the last year. Each term of all the Institute courses is divided into three parts: the advance course, from fourteen to fifteen weeks in duration; the review, about three weeks; and the examination, which takes from a week to ten days. At the time of the establishment of the two new courses the number of hours of instruction, in the advance only, of the Civil Engineering course, in each department, was as follows: Mathematics and Astronomy, 289; Surveying, 595; Stereotomy and Descriptive Geometry, 340; Chemistry, 315; French, 130; English, 68; Physics and Electricity, 333; Metallurgy, 20; Botany, 13; Geology and Mineralogy, 45; Steam Engines, 60; Mechanics, which includes Rational Mechanics, Structures, Resistance of Materials, and Hydraulics, 364. These numbers will be better understood by referring to Appendix II, in which the curriculums as at present (1914) given will be found. No hours of review or examination are counted for these comparative numbers.

After careful study the Faculty concluded that the differences between the courses in Mechanical and Electrical Engineering and that in Civil Engineering should be about 26 per cent. of the time given to instruction during the advance period and that the difference between the course in Mechanical and that in Electrical Engineering should be about 12½ per cent. The greatest difference between the courses occurred natur-

ally during the last two years. In Division A the difference between the Civil and the other two courses was about 50 per cent.

For the use of the two new departments the Trustees determined to erect, at a cost of about $300,000, a building to be known as the Russell Sage Laboratory. The remaining $700,000 of Mrs. Sage's gift was set apart as a fund for the endowment of the Department of Mechanical Engineering. The contract for the building was signed February 11, 1908, and it was completed in March, 1909. It was formally opened June 15 of the same year, at which time addresses were made by Robert W. De Forest, of New York City, who represented Mrs. Sage, Jesse M. Smith, then President of the American Society of Mechanical Engineers, and Lewis B. Stillwell, at that time President-elect of the American Institute of Electrical Engineers.

The building was erected on a hillside, with its front face on the main campus at its highest level. Like all the other new buildings, except the Club House, it is constructed of Harvard brick with Indiana limestone trimmings and fireproof floors. The interior layout of the east wing with its machinery was made by Dr. W. L. Robb, who had been the Professor of Electrical Engineering and Physics since 1902, and that of the west wing with its machinery, by Professor Arthur M. Greene, who had come to the school from the University of Missouri, in 1907, as Professor of Mechanical Engineering. The structure is 246

feet long and 80 feet in depth, except the central portion of 50 feet, which is 100 feet in depth. There are eighty-three rooms in it. The west wing contains the department of Mechanical Engineering and the east wing the department of Electrical Engineering. The central portion is used by both departments. This portion contains a large lecture room capable of seating over 400 people, a reference library, a museum, and a large drawing-room. It also contains lockers, wash rooms, janitor's quarters, and the laboratory for the large 600,000-pound machine for testing materials of construction. The west wing is 100 by 80 feet in plan and five stories in height. In it are the laboratories, class rooms, draughting-rooms, and offices of the department of Mechanical Engineering. The laboratories occupy the sub-basement, basement, and the larger part of the first floor of this half of the building, while the class rooms and lecture rooms occupy portions of the first, second, and third floors. The draughting-rooms are in the northwest corner of the second and third floors, and the offices are arranged on the different floors for convenience. Lecture rooms, which may be used as recitation rooms, are found on the second and third floors. The sub-basement floor contains three laboratories: the steam laboratory, the hydraulic laboratory, and the internal-combustion engine and refrigeration laboratory.

The east wing is 100 by 80 feet in plan and four stories in height. In it are the laboratories, class

rooms, draughting-rooms, and offices of the department of Electrical Engineering. The basement of this wing contains the generating plant, dynamo laboratory, storage battery, transformer rooms, electro-chemical laboratory, rooms for blue-printing and photographic work, and the instrument shop. The first floor contains lecture and recitation rooms and offices; the second, laboratories and research rooms; and the third, laboratories for physics and a large drawing-room.

There are also laboratories for electrical measurements; for studying high tension and alternating currents; for investigating wave forms and other alternating-current phenomena, including phase relations, field discharge, resonance, and initial conditions in circuits and cables; for the calibration, standardization, and testing of instruments, apparatus and materials used in electrical engineering, and for research work.

The actual cost of the building and furniture was $312,000. The machines and apparatus for the department of Mechanical Engineering cost about $40,000, and the value of those in the department of Electrical Engineering, including the material moved from the Proudfit Laboratory, was about the same. The 600,000-pound materials testing machine and the impact testing machine, which are a part of the equipment of the department of Rational and Technical Mechanics, cost $13,000. So that the total value of the machines and apparatus in the building was $93,000 and that of the building, furniture, and apparatus

was $405,000. More apparatus and machinery have since been installed so that the present total value is about $420,000. The structure was erected when work was scarce and the price for it was low. As it stands it probably could not, with its contents, be replaced for less than $450,000. A detailed description of the laboratories in the building, as they exist to-day, is given in Appendix IV.

In 1909 a fund was raised among the Alumni to purchase portraits of Mr. and Mrs. Sage. Mrs. Sage, however, presented the two handsome portraits which are now hung in the Museum on the second floor of the building.

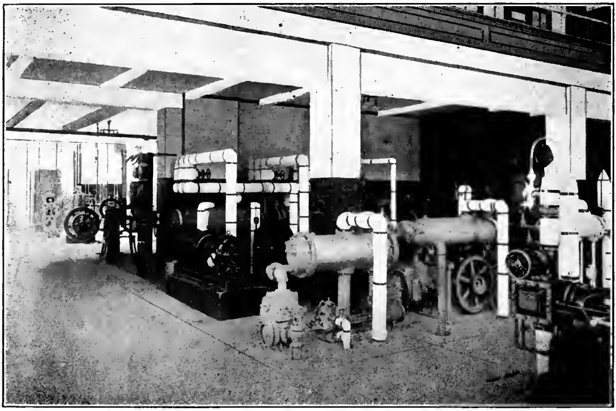
Though the act of Legislature of 1861, which consolidated the previous laws relating to the school, had been amended twice, and the special act of 1898 had been passed, there remained in Section 1 a clause to the effect that the Trustees had the power "to purchase, take, and hold, by gift, grant, or otherwise, and to dispose of any real and personal property, the yearly income of which shall not exceed ten thousand dollars." At the time of the receipt of the Sage gift the annual income of the Institute from gifts and investments already exceeded ten thousand dollars, and the gift showed the necessity of a change in Section 1. Accordingly this was amended by a law dated February 16, 1907, and by which the income of the school was not limited to any specific sum. This is the last act relating to the school passed to the present time.

Four engineering courses have been referred to

in preceding pages as being in existence in the Institute at the present time (1914). The fourth one to be inaugurated was that in Chemical Engineering. The General Science course contained much chemistry; was intended to prepare chemists rather than engineers. After the establishment of the courses in mechanical and electrical engineering the Faculty began to consider seriously the advisability of recommending to the trustees a course which would contain a considerable amount of chemistry, much more than was given in the engineering courses already in operation, and also much more engineering, particularly mechanical and electrical engineering, than was given in the General Science course. The object was to give a course which would better prepare a young graduate to take up work leading to the management of industrial plants than would any of the engineering courses or the course in science already established. Such a course was then being given in about ten of the leading schools of engineering. The recommendation was made in May, 1913, and in September of that year the course was in operation with eighteen students in Division D. The curriculum is given in Appendix II.

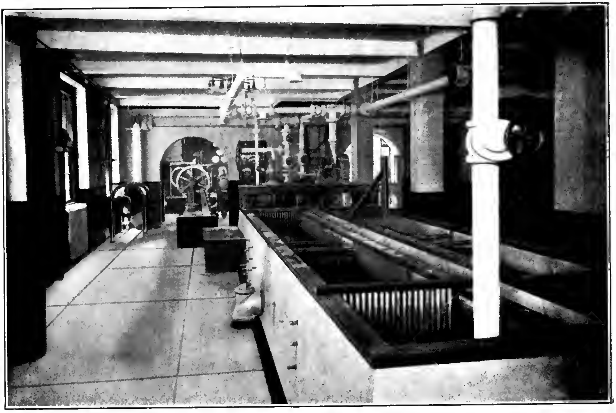
At the annual meeting of the Board of Trustees in May, 1913, graduate courses leading to Master's and Doctor's degrees were established. The former are one year in duration and are conferred in the five subdivisions corresponding to the undergraduate courses; that is, they lead to the degrees M.C.E., M.M.E., M.E.E., M.Ch.E., and M.S.

Steam Laboratory



View from Steam to Gas Engine Laboratory


View from Hydraulic to Steam Laboratory


Flumes and Water Wheels

Three years, two of which must be spent in residence, are required for the Doctor's degrees, of which three are given: Doctor of Science, Sc.D.; Doctor of Philosophy, Ph.D.; and Doctor of Engineering, Eng.D. These courses can only be taken by graduates of higher institutions of learning whose undergraduate courses and the character of whose undergraduate work fit them, in the opinion of the Faculty, to take them. The major work may be taken in any one of eleven subdivisions in engineering or science: Railroad Engineering, Highway Engineering, Hydraulic Engineering, Sanitary Engineering, Structural Engineering, Steam and Gas Engineering, Machine Design, Electrical Engineering, Chemical Engineering, Chemistry, and Pure and Applied Mathematics. Sufficient time has not elapsed since the creation of these courses for a Doctor's degree to have been given. The first Master's degree, M.M.E., was taken in 1914 by Edwards Kneass, M.E., '13, whose father, Strickland L. Kneass, was graduated in the class of '80, and whose grandfather, Strickland Kneass, was graduated in the class of '39. Mr. Kneass was on a Russell Sage, 2nd, Fellowship.

In 1910 the Institute offered scholarships giving free tuition to the five male graduates of high schools and academies in the State of New York who, of all applicants, obtained the highest marks in examinations held by the Regents, in the subjects necessary for entrance. Not more than two scholarships could be obtained by candidates from any one county. This practice has been

continued each year since then. There are now twenty students holding these scholarships.

In recognition of the interest taken in the Institute and the aid given it by the Pittsburgh Alumni Association, the trustees, in 1911, created a Pittsburgh Scholarship giving the Association the privilege of keeping one student from Pittsburgh always at the Institute without the payment of tuition.

The value of a perpetual scholarship, which permits one student to be kept constantly at the Institute without the payment of tuition, was fixed by the trustees in 1910 at not less than \$7,500. The first of these scholarships was established in 1913 by Charles Wiggins, of the class of '78, and the Board gave it his name. The second, called the Alfonzo Bills Scholarship, was established by the will of Mrs. Charlotte H. Knight, of Troy, for graduates of the Troy High School. It became effective in 1914. These are the only two endowed scholarships.

In 1913 the sum of \$30,000 was given by Mrs. Russell Sage to establish two fellowships of \$15,000 each, with the understanding that the interest from each was to be used for the support and instruction of a graduate of the Institute, or of some other similar institution, who should pursue his studies for the Master's or Doctor's degree at the school under rules formulated by the Board of Trustees. She stipulated that they should be called the Russell Sage, 2nd, Fellowships, in memory of Russell Sage, 2nd, who was graduated

from the Institute in the class of '59. One of these fellowships was given to Edwards Kneass, elsewhere referred to, and the other to Frederick M. Sebast, E.E., '13, who is a candidate for a Doctor's degree.

No good reason has ever been given for the erection of the Alumni Building on Second Street, so far away from the other buildings and so far below them. Its use as the office of the Director was extremely inconvenient. The library, while in it, was almost useless. The collections in it compelled its use for the teaching of geology and mineralogy to the great inconvenience and loss of time of students all of whose other recitations took place in the buildings half a mile away from the Alumni Building and on the hill about one hundred feet above it. When the Warren property was bought and buildings began to be erected still farther up the hill and the number of students began to increase greatly, the inconvenience became still greater and the trustees exercised great self-restraint in not using a part of the Sage gift for a new administration building. They wisely decided to wait for a time and see if a building, of such value and importance, would not be presented. It was presented toward the end of 1909 by the Pittsburgh Alumni Association, who decided to give $125,000 for this purpose; being perhaps unique among buildings owned by institutions of learning in this country in the fact that it was presented by the alumni of a single city. It is called the Pittsburgh Building. The building

was designed by W. G. Wilkins, '79, of Pittsburgh, who gave his services as an architect without compensation, and the construction was begun in 1910, though the death of the contractor prevented its completion until February, 1912. It is built of Harvard brick and Indiana limestone like the others, and is of fireproof construction. Situated on the winding road through the grounds, partly on the site of the Ranken House, which was destroyed to make way for it, two of its five stories are below and two above the main floor, which is on the road's level. Janitors' quarters and store rooms occupy the first floor and a book-stack room for the library and rooms for the distribution of literature and the exhibition of drawings, the second. The main floor contains a book-stack room, a reading room, a room for the meetings of Trustees and Faculty, and the offices of the President, Treasurer, and Registrar. The Geological and Mineralogical Museum and a lecture room and office for the Professor of Geology occupy the fourth floor, and the whole of the fifth is taken up by a room, 64 by 100 feet in size, which was intended for a draughting room, when another one becomes necessary, though it is at present used for social functions of the students. The structure was formally presented and dedicated on Alumni Day, June 13, 1911, the presentation speech being made by George S. Davison, '78, of Pittsburgh, a trustee of the school. The total value of the building, including an allowance for the architect's fee, is $132,400. The contents,

including books and specimens, is valued at $59,900.

In the description of the Pittsburgh Building it is seen that the whole floor above the main one is devoted to instruction in geology and mineralogy. More than half of the space is taken up by the museum. When the collection was moved from the Alumni Building the floor space was doubled, new cases were provided at a cost of $9,600, and new specimens were bought to round out and complete the minerals as well as the rocks and fossils. There are altogether about 15,500 specimens valued at $12,200. These collections compare very favorably with those of the larger universities. The mineralogical collection is in many respects better than that of the State.

When the number of students began to grow larger, and especially after the purchase of the Warren property and the land between it and Fifteenth Street, an agitation began for an athletic field and a gymnasium on the upper level of the campus. The gymnasium on Broadway was much too small, was not of modern design, and was nearly 150 feet below the level of the surface of most of the new land. Members of the class of '86 agreed to bear the expense of filling in a depression in a part of the new land, and thus in the summer of 1906 the '86 athletic field was constructed at a cost of about $7,000.

In 1910 the trustees appointed a committee of the Board, consisting of Messrs. W. F. Gurley, J. H. Caldwell, and A. H. Renshaw, to investigate

the feasibility of the establishment of a department of physical culture. They employed Dr. Sargent, of Harvard University, who reported that the gymnasium on Broadway was entirely inadequate for the use of the number of students then in the school. The committee concluded, after careful investigation, that a completely equipped, modern gymnasium was necessary for the establishment of a department of physical culture. In June, 1910, the Alumni Association appointed a committee consisting of Tracy C. Drake, '86; R. B. C. Bement, '69; E. V. Z. Lane, '75; F. C. Osborn, '80; and P. W. Henry, '87, to solicit funds for a new gymnasium. At the next June meeting the committee reported that about $25,000 had been subscribed. This could not be considered a very small amount when it is remembered that the Alumni had contributed hundreds of thousands of dollars to the Institute in the five years preceding this time. It was not necessary for the committee to continue its work, however, for at this meeting Stewart Johnston, of the class of '87, a member of the Board of Trustees, announced that his class would give $150,000 for the erection and equipment of the building. The erection was begun in August of the same year, but the construction was delayed and the structure was not ready for use until November, 1912.

The building is situated toward the northeast end of our main plot adjacent to the athletic field and near Avenue B. In outside measurement it is 126 feet long and 73 feet wide. In appearance it is

similar to the other new buildings, having faces of Harvard brick with trimmings of Indiana limestone. Fireproof construction is used throughout, the floors being of steel and concrete with upper surfaces of maple. The basement contains a swimming pool 30 by 75 feet in size. A filter plant and other necessary machinery are in rooms adjacent to the pool. There are four bowling alleys in a room beside the pool, with a room containing 818 lockers and shower baths on a mezzanine floor above the alleys. The first floor, which is entered from the athletic grounds, contains a basketball room, a squash court, a room for wrestling and fencing, a room for inside baseball practice, rooms for measuring and weighing students and the office of the Professor of Physical Training. The main floor, for gymnastic practice, is above the first floor, and is 120 by 67 feet in size. There is a running track of twenty laps to the mile, supported on wall brackets and suspended from the roof trusses, around the sides of this room. The building cost $145,000, and the apparatus and furniture $16,600, a total for both of $162,000. The class gave $163,000. The formal presentation to the trustees took place on June 13, 1911, though the structure was not finished at that time. The presentation address was made by Stewart Johnston.

The Trustee Committee, in the meantime, had recommended compulsory athletics for members of Division D. This was carried into effect, and the class of 1916 was the first class to use the gymnasium

in this way. A lecture course, three weeks' duration, on hygiene is given members of Division D as soon as they matriculate. In the meantime each member of the class is subjected to a careful physical examination and at the end of the lectures his compulsory exercise, of an hour a day for three days one week and two the next, begins and lasts for the remainder of the year. Field athletics at certain seasons may take the place of this exercise. Naturally many students besides the members of Division D use the gymnasium.

At this time the tuition fee was increased by $5 a year, to $205, and the club-house was thrown open for the use of all students. The amount obtained from the increase in the tuition does not, of course, half cover the annual cost of maintenance of the gymnasium alone, without considering the expense of maintaining the club-house and athletic field. At present there are a Professor of Physical Training and an Assistant in charge of the gymnasium.

Many of the subscribers to the Gymnasium Fund, when the class of '87 agreed to give the building, changed their subscriptions to a Library Fund, the interest of which is to be used to help maintain the library. The sum of $2,400 originally subscribed for the Sage portraits was also placed in this fund, which amounts, including subscriptions yet to be paid, to $25,600. The library is first mentioned, in the earliest pamphlet containing the constitution and laws of the school, which is dated March 11, 1825, as "a very ample scien-

tific library, to which the members of the institution will have free access." Ample, in this case, certainly must have been a relative term. As has been noted before, there were, in 1846, three hundred and ninety-six volumes of an estimated value of $973.45. After the fire of 1862 the library was placed in a room on the second floor of the Main Building when it was finished in 1864. This remained the Faculty room and Library until the completion of the Alumni Building in 1893, when the books were moved to the back room on the first floor of this building. In 1894 it contained about six thousand volumes and three thousand pamphlets. The professional library and drawings of Alexander L. Holley, formerly a trustee of the Institute, were bequeathed to it in 1882. In February, 1912, the books were transferred to the Pittsburgh Building, which was given partly for the purpose of providing a library and reading room adjacent to the other buildings. This building has two book-stack rooms capable of containing 125,000 volumes and a reading room capable of seating more than one hundred students. Book stacks capable of holding 25,000 volumes are provided. Up to the time of its removal to the Pittsburgh Building, the school could scarcely be said to have had a library of much use to the students. It had been only imperfectly catalogued and for twenty years had been almost inaccessible to the students on account of its distance from the other buildings. In 1912, however, the librarian and assistant immediately began a card catalogue

which has been continued to this time. The library is composed, with very few exceptions, of volumes relating to science and engineering. The number, March 1, 1914, was 10,827, and there were about 11,000 pamphlets. The periodicals regularly received, and which are placed in the reading room, number 107. There have been catalogued to date 10,024 books and 3,500 pamphlets, on about 28,000 separate cards. The books are conservatively valued at $20,900.

In 1912 the Institute was admitted to the list of accepted institutions of the Carnegie Foundation for the Advancement of Teaching, so that any member of its Faculty who has attained the age of sixty-four years, with an experience of twenty-five years as a teacher, may be retired and receive a pension for the rest of his life from the Foundation.

CHAPTER X

ALUMNI AND STUDENT ORGANIZATIONS. PUBLICATIONS. STATISTICS OF GRADUATES

EVER since the reorganization of the Institute by B. Franklin Greene each candidate for a degree has been required to present a thesis on some subject germane to his course. Such theses are read at commencement, and one of the conditions for graduation is that they must be approved by the Faculty. In order to improve their quality Charles Macdonald, C.E., LL.D., a graduate of the class of 1857, established, September 24, 1890, a prize consisting of the net annual income from $2,000, to be given to that member of Division A, in each year, who should, on graduating, present the best thesis involving a design for an engineering work or an investigation of a process or natural product, or of a natural law of especial interest to civil engineers. This prize is awarded at the commencement following that at which the competitor graduates. It has proved of much value as it increases the interest taken in their theses by those students competing for it, and incidentally has been effective in improving the character of all which are presented. Twenty-three graduates have received this prize. Their names and classes are given in Appendix V.

The Alumni Association of the Institute was or-

ganized at Troy, June 22, 1869. Annual meetings are held on commencement day of each year at Troy, and of late years it has been customary to hold winter reunions some time during February in one of the larger cities of the country containing a considerable number of resident graduates. Such meetings have been held in New York, Philadelphia, Pittsburgh, Buffalo, Kansas City, Cleveland, and Albany, and a summer meeting was held, during the Columbian Exposition, at Chicago, in August, 1893. The first general reunion was held February 18, 1881, in New York, at the residence of Hon. Clarkson N. Potter of the class of 1843. The names of graduates who have been presidents of the Association, with their terms of office, are given in Appendix VI.

A number of local alumni associations have also been formed: one, February 10, 1888, at Kansas City, called the "Central R. P. I. Association"; the "Pittsburgh Association of Graduates," May 11, 1888; the "Chicago R. P. I. Association," November 25, 1889; the "R. P. I. Alumni Association of New York City," January 17, 1893; the "Cuban R. P. I. Alumni Association," in Havana, January 20, 1907; the "Cleveland R. P. I. Alumni Association," January 14, 1909; the "Rochester Alumni Association of R. P. I.," April, 1911; and the "R. P. I. Alumni Association of Eastern New York," in Albany, May 4, 1911.

In past years a number of attempts were made by undergraduates to publish periodicals in the interest of the students and alumni of the school.

The first number of the *Rod and Leveller* appeared November 18, 1865; and in May, 1884, the *Rensselaer Polytechnic Institute Quarterly* was issued for the first time. These failed shortly after their inception. A successful effort in this direction, however, was made by Tracy C. Drake of the class of 1886, and the first number of the *Polytechnic*, with him and A. R. Elliott as editors, appeared February 16, 1885. Since that time it has been issued regularly each month during the scholastic year and is now well supported by students and alumni. Since 1908 the paper has been under the management of the Rensselaer Union and, for the past two years, has had its headquarters in the Club House. It is published by a board of editors from different classes and each issue contains about twenty-five quarto pages of scientific and literary articles and of news items relating to the school and its graduates.

The *Transit*, an annual issued under the auspices of the Fraternities by a board of editors selected from members of Division B, has been published for forty-nine consecutive years. The first number, dated December, 1865, was issued by the class of 1867. Beside the roll of members of the classes, fraternities and societies, it contains lists of members of the athletic, glee and other clubs, and miscellaneous organizations. The *Transit* of the class of 1914 is a profusely illustrated book of 361 pages.

The "Selected Papers" of the Rensselaer Society of Engineers are also published at irregular intervals. These are often of much scientific value.

The *Hand Book*, a little pocket book giving in-

formation about the Institute of value to new students, was first issued by the Young Men's Christian Association of the school in 1893. When this association became a committee of the Rensselaer Union the publication was continued by the Union and it is now published by the Polytechnic Board. It now contains about one hundred pages and is distributed free to incoming students.

In 1912 and 1913 the Polytechnic Board compiled a book of "Songs of Rensselaer." It is a quarto of one hundred and twenty pages of songs set to music. About a dozen were written especially for the school, and the others are college songs popular at the Institute. The first, "Old Rensselaer," was written by Mrs. E. H. Jarrett in 1908, and was dedicated to the class of 1889. The music, an old Welsh air entitled Ar Hyd y Nos, was selected by E. H. Jarrett, '89. The words of "Old Rensselaer" follow:

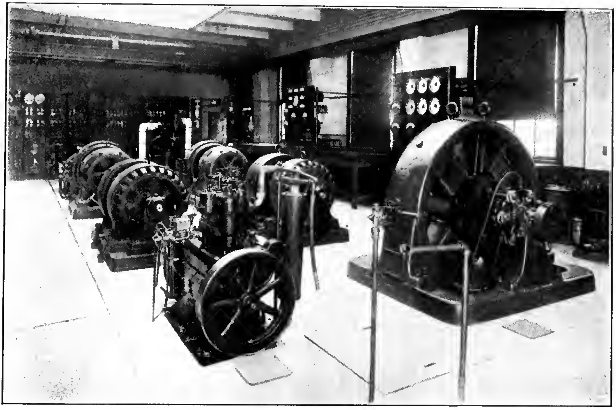
Thou hast sent us forth to labor,
  Old Rensselaer.
We have wrought to win thy favor
  Year after year.
Steel to wield and stone to shiver,
Sink the mine and span the river,
For thine honor toiling ever,
  Old Rensselaer.

When thy sons are met together
  From far and near,
Scarred with service, worn with weather,
  Old Rensselaer,
Proud they lay their deeds before thee,
Done to show the love they bore thee,
Stronger grown as years pass o'er thee,
  Old Rensselaer.

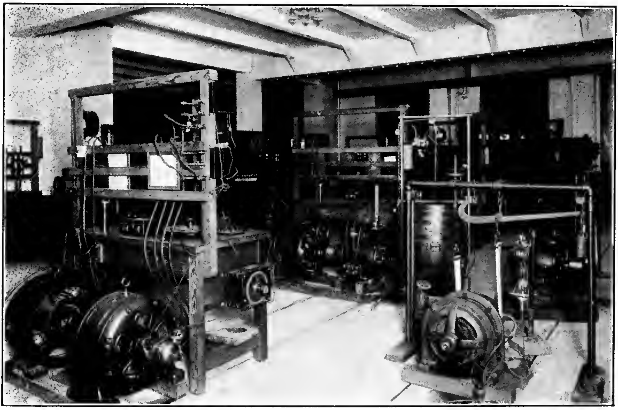
When they write our nation's story,
Splendid and clear,
Surely great shall be thy glory,
Old Rensselaer.
In their works thy sons enshrined thee,
Mighty works to leave behind thee,
Motherland, let these remind thee
Of old Rensselaer.

It is believed that the first publication issued by the trustees of Rensselaer School was a pamphlet of twenty-three pages entitled "The Constitution and Laws of Rensselaer School, in Troy, New York; adopted by the Board of Trustees, March 11, 1825." It is dated March 14, 1825. Reference to it and its contents is made in a footnote on a preceding page. There was not much regularity in either the number of pages or the date of issue of the earlier "notices" of the school. Until the reorganization in 1850, after which the "Annual Registers" were published once and often twice a year, the "notices" varied in length from one to forty pages; the latter issue containing a digest of the rules of the school and a triennial catalogue of the students. The names of the students were not regularly published until 1847, after which date they appeared in each issue of the catalogue. The names and addresses of graduates first appeared in the Register of November, 1860, in which they occupied three pages. In the catalogue of 1914 they, with the index and geographical index, occupy one hundred and thirty-six pages. The index was printed for the first time in the Register of October, 1866, and the Geographical Index in that of June,

1890. The Annual Register of March, 1902, was published as Volume I, Number 1, of a series of Rensselaer Polytechnic Institute "Bulletins," which appear quarterly and are issued in March, June, September, and December. In 1903 the name of the March Bulletin was changed from Register to Catalogue, to make it conform in name to similar publications of other educational institutions. Since then the quarterly numbers have appeared regularly, consisting of a Commencement Number, generally containing a list of the theses of the graduating class and illustrations, with the other numbers containing generally either descriptions of the laboratories, a "Handbook of Information" describing the methods of instruction, or pamphlets describing the work of graduates. One of the latter, referred to on a later page, entitled "A Partial Record of the Work of Graduates," consists of forty pages of text only and gives the names of many of the alumni who have attained high rank in the profession; another of one hundred and eight pages, called "Photographic Reproductions of Work of Graduates," has a preface, only, in text, followed by one hundred and ninety-eight half-tone illustrations, showing some of the great engineering constructions with which graduates have been connected as designers or constructors. The number of each issue varies generally from six to ten thousand, though two hundred and fifty-eight thousand copies of the June, 1912, Bulletin, an illustrated pamphlet of twenty-four pages, entitled "General Information, Curriculums, Illustrations," were dis-



Part of Electrical Laboratory



Experimental Electrical Laboratory

Electrochemical Laboratory

Measurements in Light

tributed. The Commencement number of Volume VI, 1907, contains the dedication of the Carnegie Building; that of Volume VIII, 1909, is entitled "The Formal Opening of the Russell Sage Laboratory"; the dedication of the Pittsburgh Building is described in an extra to No. 2, Volume XI, 1912, and that of the '87 Gymnasium in No. IV of the same volume.

Two editions of an illustrated pamphlet of forty pages, in the Spanish language, entitled "Boletin del Instituto Politecnico de Rensselaer," have been issued in recent years. These are sent to applicants for catalogues in Spanish-American countries.

Beside the Bulletins there is an "Engineering and Science Series" published by the authorities of the school. The first number appeared in February, 1911, and the others have been published at irregular intervals since that time. The last was No. 6. The results of investigations made in the laboratories of the school, whether by professors or students, are given in these pamphlets. The value of these investigations was recognized by Louis E. Laflin, of the class of '82, who gave, this year, the sum of $10,000, the interest on which is to be used to pay for materials and apparatus used in such work.

The first college fraternity to establish a chapter at the Institute was the Theta Delta Chi. The Delta chapter was chartered in 1853, remained until 1870, was re-established in 1883, and ceased to exist in 1896. There are seven existing at present: the Alpha chapter of Theta Xi (1864), Lambda of

Delta Phi (1864), Psi Omega of Delta Kappa Epsilon (1867), Theta of Chi Phi (1878), Upsilon of Delta Tau Delta (1879), Delta of Theta Chi (1909), and Gamma of Phi Sigma Delta (1913). The Pi chapter of Zeta Psi was established in 1865 and withdrawn in 1893. Several others were chartered at various times but were withdrawn after an existence of one or two years.

All of these fraternities have chapter houses. Only one, however, the Chi Phi, owns a house. This was built in 1912. It is situated on the corner of Avenue B and Fifteenth Street. Two other fraternities, the Theta Xi and Delta Phi, have recently bought land in the same neighborhood, upon which they expect to build in the near future.

The Pi Eta Scientific Society, organized January, 1866, became afterwards the Rensselaer Society of Engineers, which was incorporated by act of legislature in May, 1873. Papers are read by the student members at the meetings throughout the year and scientific lectures are also delivered at intervals by graduate members of the society and others.

The Zeta chapter of the Sigma Xi Society was established at the Institute May 6, 1887. This society is modelled to some extent after Phi Beta Kappa, though it is not a secret society. Its undergraduate members are chosen only from those who have distinguished themselves in scholastic work.

The Gamma chapter of Tau Beta Pi was established at the Institute in 1908. It is an honorary engineering society. Its membership is

drawn from those members of Division B who stand among the first quarter of the class.

The Rensselaer Technical Society has a purpose similar to that of the Rensselaer Society of Engineers. It was organized in 1906 and incorporated under the laws of the State in May, 1909.

The Rensselaer Polytechnic Institute Student Branch of the American Society of Mechanical Engineers was organized in 1910, and the Rensselaer Polytechnic Institute Branch of the American Institute of Electrical Engineers was organized in the same year. Monthly meetings of both of these organizations are held, at which papers on engineering subjects are read and discussed.

An organization called the "Student Council" was established in March, 1910, with a constitution ratified by the Faculty and Board of Trustees. Its object, as defined by the constitution is "to furnish a high reward of merit for conscientious effort in furthering the best interests of the Institute and its undergraduate organizations and to provide a representative body of men who, by virtue of their diversity of interest and influence, may be able fairly to represent the sanest phase of undergraduate opinion and form a link between the undergraduate body and the Faculty and Board of Trustees for the purpose of concerted effort along any line where such effort seems necessary and advisable."

The Council is given authority to take into consideration the conduct of any student or body of students detrimental to the best interests of the

Institute and to recommend to the authorities such action as it may deem advisable. It is expected particularly to investigate all cases of wilful destruction of property of the Institute. Questions of interest to the student body are referred to it from time to time by the President. It has the power to confer with the Faculty and Prudential Committee of the Board of Trustees, but it may only recommend and has no executive authority. It consists of the Grand Marshal, ten members of Division A to serve one year and two members of Division B to serve two years. One member of Division A is chosen from each of the existing societies and fraternities and two from the neutral members of the class. The two members of Division B are neutrals.

The Phalanx is a society composed of members of Division A, who have distinguished themselves in athletics and other activities. They are selected at the end of the third year, by the outgoing active members. The society was organized in 1912, by members of the Student Council, with the object of creating a body of students who would promote the growth of and encourage all student activities and interests.

Many students' clubs have been formed at the school: The Union Hispano-Americana, organized in 1898, is composed of Spanish-American students; the K. C. N. Society of Chemists (1903); the Scalp and Blade, organized as the Buffalo Club in 1907; Phi Upsilon, of students in the chemical department (1906); the Williston Club, composed

of graduates of Williston Seminary; the membership of the Southern Club, organized in 1907, is confined to students from the Southern States; the Scholarship Club takes its membership from those holding scholarships (1911); the Aeronautical Society, organized in 1911; the British Club (1912); the Western Club (1912), eligible only to students from States west of the Mississippi River; the Holyoke Club, of students from Holyoke, Mass.; the Chess and Checker Club, and the Campus Club (1913). The Connecticut Club, composed of students from that State, and the New Jersey Club, of students from New Jersey were both established in this year (1914). The Press Club was organized in 1913 to collect and disseminate news regarding events of interest occurring at the school. It is composed of ten students and a member of the Faculty, who acts in an advisory capacity. The Club is under the jurisdiction of the Rensselaer Union. There are four musical organizations: the Glee Club, the Orchestra, the Mandolin Club, and the Band. Of these the Glee Club is the oldest, having been organized in 1860, while the Orchestra and Mandolin Club originated in 1872. The number of members of each club varies from ten to thirty, depending upon the available material. Each club has its leader and a manager who makes arrangements for the concerts and takes care of the finances. Several concerts are given each year in Troy and near-by cities by the Mandolin and Glee Clubs and Orchestra, while the Band plays

at all the home athletic contests and at different school festivities held throughout the year.

The Institute has had exhibits at six world's fairs. It sent some students' drawings to the World's Industrial and Cotton Centennial Exposition, held at New Orleans in 1884–85, and received a medal and diploma of the "First Order of Merit" for mechanical and free-hand drawing. It also obtained for its exhibit at the Universal Exposition of the French Republic at Paris, in 1889, the only grand prize awarded to any American scientific school. At the World's Columbian Exposition of 1893, in Chicago, it exhibited the work of its students and graduates and received awards for each, worded as follows: "Superior instruction in matter and method, through its long continued service. Marked attainments of its students in all forms of class work, including topography, railroad maps, mechanical drawing and theses"; and "The magnificent work of its graduates, including (*a*) the arches of the Liberal Arts Building, (*b*) the Ferris Wheel, (*c*) the Brooklyn Bridge, (*d*) the Poughkeepsie Bridge, (*e*) the models of their inventions, (*f*) the bibliography of their publications."

No medals were awarded to any exhibitor at Chicago. At the Pan-American Exposition in Buffalo, in 1901, a gold medal was given for "students' work and results" and one was received from the South Carolina Industrial and West Indian Exposition in Charleston, in 1902, for "educational methods and results." For the same

reason a grand prize was awarded for the exhibit at the Universal Exposition at St. Louis in 1904. No exhibit has been prepared for the Panama-Pacific International Exposition at San Francisco next year (1915).

Inquiries having been made, from time to time, for the coat-of-arms of the Institute for use in the decoration of rooms in university clubs in various cities, one was originated in 1904. It consists of a shield, the upper part of which contains the coat-of-arms of Stephen Van Rensselaer placed "in chief." That is, it is squeezed up together and placed across the top of the shield. The lower part of the shield contains the Institute colors, in three vertical bars, the outside ones in cherry and the middle one in white. On the white is the target of a levelling rod with part of the rod. The target was placed on the shield because it has been used as an Institute button by the students for a considerable number of years. It was evidently appropriate to use the coat-of-arms of the founder. The motto "Knowledge and Thoroughness" was originated and used because it was thought to represent that for which the Institute stands. In 1905 enameled pins were made of the shield, and these have since been worn by many graduates. Undergraduates are not supposed to wear them. They use the button resembling a level rod target.

In the ninety years which have elapsed since the foundation of the Institute, from 1824 to 1914, inclusive, there have been 2,117 graduates. Of

these 559 are known to be dead, so that about 1,558 are living. This number cannot be given exactly, as there are doubtless a few dead, especially in the early years, who have not been so recorded. Of these graduates, 67 received the degree A.B. (r.s.); 77 that of Bachelor of Natural Science, B.N.S.; 1,865 were graduated as Civil Engineers, C.E.; 23 as Mining Engineers, M.E.; five as Topographical Engineers, T.E.; 38 as Mechanical Engineers, M.E.; 57 as Electrical Engineers, E.E.; and the degree of Bachelor of Science was conferred upon 50. Twenty-one hundred and eighty-two degrees have therefore been conferred upon graduates. Sixty-four of them took two degrees each. Fifty-four of those who took two degrees were graduated before the reorganization of 1850, and obtained both C.E. and B.N.S. At the present time any one who takes a second degree has to remain two years to secure it. The figures given above refer to degrees for undergraduate work. Only one degree for graduate work, Master of Mechanical Engineering, M.M.E., has been given; this was given in 1914. A list of each graduate with the degree he received and the year of his graduation is given in Appendix X.

Only four honorary degrees have been conferred: In 1882 the honorary degree of Civil Engineer was conferred upon Charles H. Fisher, Chief Engineer of the New York Central and Hudson River Railroad, who had been a student in the class of 1853, and also upon Luiz da R. Dias, Chief Engineer of the Bahia and Caribbean Railroad, Brazil, who had

been graduated in the class of 1860 as a Topographical Engineer. In 1884 the degree of Civil Engineer was also conferred upon William B. Cogswell, formerly of the class of 1852, the Chief Engineer and General Manager of the Solvay Process Company, of Syracuse, N. Y. At the same time the honorary degree of Doctor of Philosophy was given James C. Booth, Director of the United States Mint at Philadelphia, who in 1831 had been a student at the school and an assistant to the Senior Professor.

The total number of students who have attended the Institute cannot be exactly determined though it approximates six thousand.

Its reputation as a school of engineering is well known; its fame was early established. Its renown has not been due to its age, but to its methods of instruction, its rigid requirements for graduation and the work of its alumni.

Its requirements for graduation may be indicated in a general way by finding the ratio of the graduates in any class to the total number of students who have been members of it. Such ratios for every decade since the reorganization, beginning with 1860, are as follows: for the class of 1860 the percentage is 45.0, for 1870 it is 31.6, for 1880 it becomes 33.3, for 1890 it is 27.0, for 1900, 32.3, and for 1910 it is 22.1. The highest ratio, 50.0 per cent, is found for the class of 1885. In the class of 1874 it is 17.5 per cent, in that of 1896, 13.0, and in the class of 1914 it is 29.7 per cent. The average ratio for the last sixty years is 34.0 per cent.

The students have come from fifty of the States and Territories of the Union and from many foreign countries, including the Bahamas, Brazil, Canada, Chili, China, Costa Rica, Cuba, Ecuador, England, Germany, Honduras, Ireland, Italy, Japan, Mexico, New Brunswick, Nicaragua, Nova Scotia, Panama, Peru, Porto Rico, Republic of Colombia, Russia, Santo Domingo, Sandwich Islands, Spain, Turkey, and Venezuela.

It is, however, to the work of its graduates that the reputation of the school is largely due. They have left an imprint in the history of the scientific development, constructive art, and material progress of this and other countries which cannot be effaced. Their success has been marked not only in the profession of engineering and as scientific investigators but in business pursuits. It has been widespread.

An appendix to the annual catalogue of the school contains the address and occupation of each one of the alumni. The living ones are at present at work in forty-nine of the States and Territories of the Union and in eighteen foreign countries. In 1908 a pamphlet entitled "A Partial Record of the Work of the Graduates of the Rensselaer Polytechnic Institute" was compiled from the Annual Registers. It gives the names and positions of those of the alumni whose pursuits could be easily classified. Even in this particular it is necessarily incomplete, and no mention is made in it of many who have attained eminence in various callings. This partial list contains the names of

one hundred and nineteen (119) presidents, two hundred and eighty-one (281) vice-presidents, managers, and superintendents, and one hundred and sixty (160) chief engineers of railway companies, steel and iron works, bridge companies, water works, machine works, electric companies, mining companies, sewerage systems, canals, and other engineering constructions. It shows that they have helped to build and operate more than one hundred and sixty-two thousand (162,000) miles of the railroad systems of North America alone and that they have been connected as designers and constructors with nearly all the important bridge companies and many of the great bridges of the country. There is given also a list of seventy-nine who have been professors in our leading universities, colleges, and schools of science.

CHAPTER XI

FINANCES. PRESENT-DAY EQUIPMENT AND METHODS. STATISTICS OF STUDENTS

FOR the first eighty years of its existence the school could be classed, financially, only among the poorer institutions of learning of the country. In its early days a considerable portion of the expense of its maintenance was borne by the founder; during the first eight years he expended more than $22,000 in its support. Upon the removal to the Van der Heyden mansion, in 1834, he built a laboratory and rooms for study upon the new site, and he continued to assist the institution until his death in 1839. Its equipment at first was not great, though it compared favorably with that used for scientific purposes in the oldest and wealthiest colleges. In 1828 the collections and library were valued at $3,615 and the real estate at $1,348. The total value of its property was $5,009. The complete inventory made in 1846, after the removal to the Infant School lot, showed the total value of real estate, invested funds, library, and apparatus to be $15,851 and the debts to amount to $1,050. This value, though small, was not inconsiderable for schools of science at that period.

In their endeavor to increase their facilities for instruction the authorities of the school at various times, during the first forty years of its existence, made appeals for aid to the legislature of the State. One such petition, signed by B. Franklin Greene, LeGrand B. Cannon, John B. Tibbits, and D. Thomas Vail, was presented shortly after the reorganization, and in the act making appropriations for general purposes, passed July 10, 1851, $3,000 was given to the Institute. To aid in rebuilding, after the fire of 1862, $10,000 was appropriated April 23, 1863. Another memorial signed by all of the trustees and by Director Charles Drowne was presented in 1866. They asked for $50,000. This was not given, but by an act passed April 23, 1864, the State Palæontologist was authorized to select from the duplicate fossils belonging to the State, and present to the Institute, a collection as full and complete as could be made. The fossils were given and an appropriation of $15,000 was also made May 8, 1868. Again in 1861, by an act passed April 28, $3,750 was donated. These sums, together with the $744 received from the Regents between the years 1846 and 1853, while the Institute was under their visitation as an academy, make the total amount of money received from the State, since the foundation of the school, $32,494. This is wholly inconsiderable when compared with the sums which have been received from the same source by other institutions.

The Institute continued its struggle for increased

endowment, and as the years rolled on its assets continued slowly to increase. The gift of the Proudfit Observatory in 1875, the work of the Graduates' Endowment Committee of 1882–4, the endowment of the chair of Mechanics by Mrs. Hart, in 1883, the efforts to raise a gymnasium fund in 1885–6 followed by the erection of the gymnasium on Broadway and the construction of the Alumni Building, following the collection of the Alumni Building fund of 1890, have already been recorded. Neither of the last two funds was sufficient to erect the building, and the Board of Trustees had to make appropriations to complete them. The Gymnasium fund amounted to $7,900, about half the cost of the building, and the Alumni Building fund to $21,200. The Alumni Association, however, continued making remittances to the trustees until they had paid the entire cost of the building. An "Alumni Endowment Fund" was begun in 1896 and continued for about two years. The amount raised was $32,700. The "Mechanical Laboratory Fund" of 1899–1901 secured $48,500, and a "Repair Fund" in 1902 amounted to $4,700. A table in Appendix VII gives the assets of the school for each year from 1902 to date. In 1904 the total property amounted to $580,000. The assets for the year 1904 are given because this was the year of the fires in the Main Building and Chemical Laboratory, which were followed by the purchase of more land and the erection of the new buildings; the beginning of a new era for the school. After the fires, all the friends of the school worked

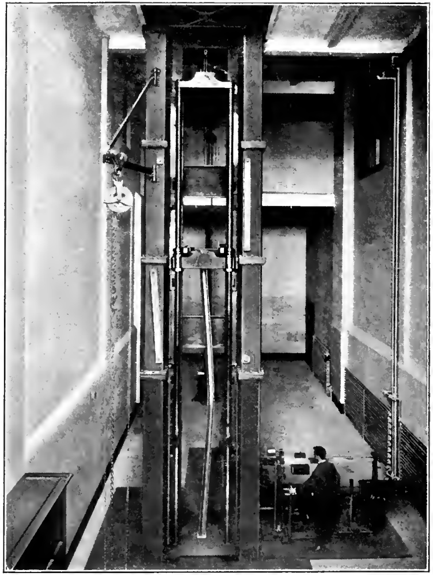
hard to place it upon a more secure basis. A "Rebuilding Fund" was started, which by May 1, 1905, amounted to $147,900; the gifts for the year ending on this date amounted to $523,450, and the gifts for the two years ending May 1, 1907, amounted to $1,083,545. Mrs. R. J. C. Walker, whose son, Dr. William Weightman Walker, was graduated in the class of '86, gave, in September, 1904, as a memorial to him, the sum of $100,000, which was followed in April, 1905, by another gift of $110,000. She had some years before this given $10,000, so that the Institute received from her $220,000. The gifts of J. J. Albright, '68, Andrew Carnegie, and Mrs. Sage have already been mentioned. One alumnus who does not wish his name mentioned gave, within a period of eight years, $275,000, part of this being subscriptions to building funds. Washington A. Roebling, '57, gave $26,000, and $10,000 more was given by Charles G. Roebling, '71, and John A. Roebling, '88; all members of a family celebrated in the engineering annals of the country. Invidious distinction is not meant by the mention of these gifts of particular individuals, but special circumstances where, for instance, gifts have been made for specific purposes render it advisable in order to make the information given more exact. Many other graduates and friends of the school gave large sums and many more smaller sums which evinced as much self-denial and interest in their Alma Mater as any which have been mentioned. The sudden death of Athol M. Miller, Jr., '95, of Duluth, Minn., occurred February 16, 1912.

He was a young man of unusual ability, energy and promise. At his expressed wish his stock in the Incas Iron Company, one hundred and thirty-eight shares altogether, was given to the Institute. This stock represents part of a lease in an iron mine which has nine years yet to run. Its value cannot be exactly determined, but it is probably worth from $150,000 to $200,000. It is a curious circumstance that, with this exception, no property has been left to the school by any of its graduates during the ninety years of its existence. They have given liberally at times, but not by bequest. Since 1872 five sums have been received by bequests from citizens of Troy: $15,000 from Gen. John A. Wool, $10,000 from A. B. Filer, $10,000 from Joseph M. Warren, $3,500 from John I. Thompson, and $5,000 from Richard F. Hall. Although not exactly a bequest, the sum of $10,000 was given, in 1913, by Mrs. George B. Cluett, in accordance with the desire of her husband expressed before his death. Mr. Cluett had been a Trustee and had given during his lifetime sums aggregating $6,500 to the school.

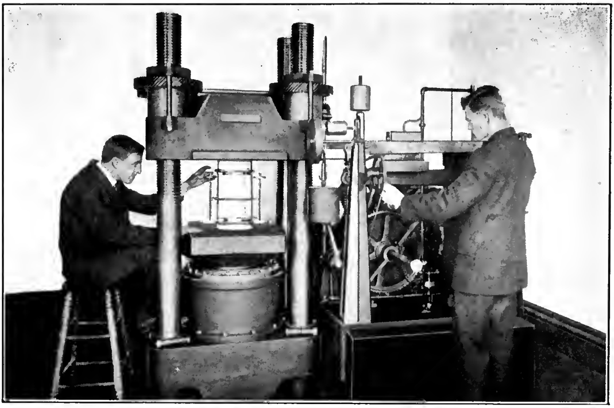
Another citizen of Troy, Thomas W. Holmes, who died this year (1914), left $50,000 to the Institute, but this will not be received until next year.

The table in Appendix VII shows that, in 1914, the value of the grounds and buildings and their contents is $1,505,100, and that the investments and cash amount to $1,347,400, a total of $2,852,-500. The Incas stock is only valued at par, $6,900,

Part of Photometric Laboratory



Testing Machine. Capacity, 600,000 Pounds



Compression Machine. Capacity, 1,200,000 Pounds

Torsion Machine. Capacity, 125,000 Inch Pounds

in this estimate, so that the total assets are probably more than $3,000,000.

At the present time the school owns thirteen buildings. Three of them, the Alumni Building, now vacant and to be sold, the old Gymnasium, now rented to the Troy Academy, and the old Chemical Laboratory, now used as the shop for the summer courses in Mechanical Engineering, are not on the main campus. All of the others are on the largest plot of land and all were built between 1906 and 1912. Four of these, the Carnegie Building, Walker Laboratory, Proudfit Laboratory and the Russell Sage Laboratory, are used only for purposes of instruction, and the Pittsburgh Building is used for instruction in geology and mineralogy, though the library and offices of administration take up the greater part of the space in it. The remaining buildings are the '87 Gymnasium, the Club House, the Dormitory, the Boiler House, and a small one-story building on Avenue B, near the boiler house, about 40 by 20 feet in size, built in 1911, of the same brick and trimmings as the other buildings, used as a carpenter shop. There is a wooden grand-stand and two bleachers on the athletic field and a hockey rink on the ground owned by the Institute and separated from the main campus by Avenue B. The various buildings and their contents have been completely described in preceding pages.

The scholastic year is divided into two terms, the first beginning about the middle of September, and the second about the first of February. The

latter ends with Commencement about the middle of June. The Christmas vacation lasts about ten days, and the mid-term vacation, in February, about a week. Each term is divided into three periods, the advance, the review, and the examination. The advance, during which the student takes up a subject for the first time, lasts about fifteen weeks, the review about three, and the examination period is about one week in duration. In the review no new subject is studied, but those taken during the advance are repeated. During both the advance and review, when a subject is once taken up, it is continued until it is finished. Recitations are held on consecutive days until the course is ended. The methods of instruction are similar to those in vogue shortly after the reorganization. Text-books are largely used, though these are almost invariably supplemented by lectures. Sometimes the recitations consist of interrogations only, but generally both interrogation and blackboard work are required every day.

Recitations generally take place on five days of the week only, Saturday being free; but this day has often to be devoted to making up work in drawing and other subjects, and during the review and examination periods it has often, also, to be used for recitations.

In nearly every class and every subject each student recites each day. This is thought to be a matter of prime importance. The sections are small. For instance, in the department of pure mathematics they generally number from fifteen

to eighteen. The recitations in this department are one hour and a quarter in length, the first twenty minutes being devoted to interrogation and explanation and the remainder of the time to parts of the text and examples which are placed upon the blackboard by the students. In the department of Rational and Technical Mechanics, the class is divided into sections of about thirty, and each section, after a combined lecture and thorough interrogation by the professor in charge, is divided into smaller sections of about fifteen each, and these go to an assistant for a recitation on certain selected parts of the subject. The assistant requires each student each day to put one of these parts of the text or an example on the blackboard and explain it. During this explanation he is interrogated upon the principles involved. This method is followed in most of the subjects found in the curriculums, though in some subjects, such as theoretical chemistry and physics, experimental lectures are given not accompanied by an interrogation and this is followed by interrogation and blackboard work.

Daily marks are kept of the work of each student and in general the averages of the three periods are taken to determine whether he has passed in a subject. He would be conditioned, however, if his examination mark were poor, and no matter how good his examination might be he would not be passed with poor work in the advance and review periods. In other words, cramming is useless; the results depend principally on the daily work throughout the term. The marks range from zero

to four, and three, or seventy-five per cent, is the passing mark.

The laboratories are used to illustrate the principles taught in the corresponding courses; the daily periods for undergraduates are from two and a half to three hours in duration. Original researches are also made in them by instructors and by some undergraduate and graduate students for their theses.

Much drafting of various kinds is given in all of the courses during the first two years, and design courses, which require drafting, are given in some of them during the last years. The drawing courses, like the laboratory courses, are generally about two hours and a half in duration. The practical surveying, not done during the summer vacations, is generally scheduled for the afternoon and takes about three hours each day while the courses last. In fact, drafting, laboratory work and practical surveying are regarded as "scholastic amusements," to use the term employed by Amos Eaton in his circular of September 14, 1826, and are scheduled for the afternoons where possible, while the theoretic subjects are given in the morning whenever the program can be so arranged.

Beside the work which occurs between September 15 and June 15, in the Civil Engineering department, students who have completed the work of Division C take a three weeks' course in Topographical and Hydrographical Surveying, during June and part of July, in the country within fifty miles of Troy, and those who have completed the

work of Division B take a course of the same length in Railroad Engineering practice during a part of August and September. Students in the Mechanical and Electrical Engineering departments, at the end of the same years, take four weeks' courses in shopwork, including machine and pattern work, during the summer vacations. In all of these summer courses the student is employed eight hours a day for six days in the week.

During the same vacation each student in each course is required to write a thesis on some engineering subject approved by the Faculty. As heretofore explained, in describing the Macdonald prize, a graduating thesis, also, must be prepared by each candidate for a degree and this must be read and defended before the Faculty. The latter covers a very wide range of subjects and are either designs or investigations of an engineering or scientific nature. A number of them are presented each year for the Macdonald prize and four of them have been printed in the Engineering and Science Series

The first term of Division D of all the five courses is the same, and the second term is nearly the same, though more chemistry is given in the General Science and Chemical Engineering courses than in the others. The first term of Division C is also nearly the same for all, but thereafter a divergence begins which becomes more marked with each succeeding term. In general, the first two years are preparatory years and in the last two most of the practical and applied subjects are given. The

General Science course differs more from the engineering courses than they do from each other, and the Chemical Engineering course differs more from the other three engineering courses than they do from one another. In the narrative of the establishment of the courses in Mechanical and Electrical Engineering given in preceding pages of this history the amount of divergence of these courses from the Civil Engineering course is given as a percentage of the time given to instruction during the advance period and is shown not to be great, and the divergence of the Mechanical from the Electrical course is shown to be still less. In fact, the intention was to make all of the engineering courses general in their character, with many of the principles and applications of each common to all. All of the curriculums are constantly being changed and improved in some particular. The schedules of the various courses, as they exist today, are given in Appendix II.

Athletic exercise, either in the gymnasium or on the athletic field, is compulsory, at present, only for members of Division D. The schedule is so arranged that this exercise comes at the end either of the morning or afternoon recitations.

Table I in Appendix VIII gives the total number of students, the number catalogued in Division D, and the number graduated in each year from 1863 to the present time. The number catalogued in Division D is considerably larger than the number of new students each year, since any member of Division C with a condition, no matter how small,

is catalogued in Division D. The number of new students last year was 194 and this year 210. The table shows that the largest number of students was here in 1908–9. This was due to the fact that the entrance requirements were then lower and notice was given that they would be materially raised the next year. The great increase since the year 1900 is noticeable. Table II in the same appendix shows the distribution of students in the various courses in 1914, and Table III shows the number graduated in each department for the four years ending in 1914. The first classes in mechanical and electrical engineering were graduated in 1911. Students now in the Institute come from thirty-eight of the States and Territories and from twelve foreign countries. About sixty per cent. of them come from the State of New York. Table IV in the appendix shows the increase in the number of teachers since 1904. In the latter year the ratio of the number of students to teachers was eighteen. It is now ten.

A complete list of all teachers of all grades from 1824 to 1914 inclusive, with the dates of their service, is given in Appendix IX. The same appendix contains the names and dates of services of all the trustees and their officers since the foundation of the school, and Appendix X gives the name, degree received, and date of graduation of each alumnus.

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All the more important publications and records, known to the writer, relating to the school from the time of its foundation to the present date are given in the following list. More or less use has been made of most of them in collecting the information given in this history.

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Rensselaer Institute, Troy, N. Y., Notices for the Ninth Annual Course, 1832 and 1833. 8vo, 4 pp.

A Digest of the Laws and Rules of Exercise and Discipline in Rensselaer Institute. With a Triennial Catalogue. 1833. 8vo, 40 pp.

Synopsis of the Mathematical Course of Instruction at Rensselaer Institute from November 19, 1834, to February 11, 1835. 4to, 1 p.

Notices of Rensselaer Institute, Troy, N. Y. October 14, 1835. 8vo, 4 pp.

This is printed in full in Chapter VI.

Periodical Notices of Rensselaer Institute. To Engineers, Geologists, Chemists, Naturalists, etc. 1838 and 1839. 8vo, 8 pp.

Rensselaer Institute, 35th Semi-annual Session for 1841–2. 8vo, 8 pp.

Rensselaer Institute, 37th Semi-annual Session for 1842–3. 8vo, 8 pp.

Catalogues for the years 1844, 1845, 1846, 1847, and 1849.

Announcement of the Fifty-second Semi-annual Session of

the Polytechnic Institution at the City of Troy. April 15, 1850. 4to, 4 pp.

Programme, etc., of the Rensselaer Institute: a Polytechnic Institution at the City of Troy, N. Y. February 1, 1851. 8vo, 8 pp.

To the Legislature of the State of New York. 8vo, 8 pp.

This is a memorial signed by a committee composed of B. Franklin Greene, Le Grand B. Cannon, John B. Tibbits and D. Thomas Vail.

Annual Registers of the Institute, dated as follows: August, 1851; October, 1852; August, 1854; August, 1855; March, 1857; May, 1858; 1859; August, 1859; 1860; November, 1860; July, 1861; July, 1862; November, 1862; July, 1863; 1863–64, First Term; 1863–64, Second Term; July, 1864; 1864–65, First Term; July, 1865; November, 1865; July, 1866; October, 1866; July, 1867; December, 1867; July, 1868; November, 1868; July, 1869; December, 1869; April, 1870; July, 1870; July, 1871; June, 1872; September, 1872; December, 1872; July, 1873; December, 1873; May, 1874; July, 1874; July, 1875; November, 1875; August, 1876; February, 1877; July, 1877; 1877–78; July, 1878; April, 1879; November, 1879; June, 1880; November, 1880; July, 1881; January, 1882; November, 1882; February, 1883; October, 1883; April, 1884; February, 1885; July, 1885; June, 1886; July, 1886; January, 1887; November, 1887; May, 1888; May, 1889; November, 1889; June, 1890; 1891; March, 1892; April, 1893; March, 1894; May, 1895; 1896; April, 1897; March, 1898; Second Edition, 1898; March, 1899; 1900; November, 1900; April, 1901.

In March, 1902, the Register was issued as Vol. 1, No. 1, of the quarterly Bulletins published from this time onward;* three supplements to No. 1; No. 2, describing the Electrical courses; No. 3, a Handbook;* No. 4, Laboratories;* the March, 1903, Bulletin, Vol. 2, No. 1, was called the Catalogue, the name Register being no

* See page 160.

longer used; No. 2, Commencement;* No. 3, Handbook; No. 4, Laboratories; Vol. 3, 1904, No. 1, Catalogue; No. 2, Commencement; No. 3, Handbook; No. 4, Laboratories; Vol. 4, 1905, No. 1, Catalogue; No. 2, Commencement; No. 3, Photographic Reproductions of Work of Graduates;* No. 4, Laboratories; Vol. 5, 1906, No. 1, Catalogue; No. 2, Commencement; No. 3, Handbook; No. 4, Buildings and Laboratories; Vol. 6, 1907, No. 1, Catalogue; No. 2, Dedication of Carnegie Building; No. 3, Photographic Reproductions;* No. 4, Buildings and Laboratories; Vol. 7, 1908, No. 1, Catalogue; No. 2, Commencement; No. 3, Partial Record of Work of Graduates;* No. 4, Buildings and Laboratories; Vol. 8, 1909, No. 1, Catalogue; No. 2, Opening of the Russell Sage Laboratory; No. 3, Handbook; No. 4, Williams Proudfit Laboratory; Vol. 9, 1910, No. 1, Catalogue; Extra to No. 1, Photographic Reproductions; No. 2, Commencement; No. 3, Handbook; No. 4, Laboratories; Vol. 10, 1911, No. 1, Catalogue; No. 2, Commencement; No. 3, Handbook; No. 4, General Information, Curriculums, Illustrations;* Vol. 11, 1912, No. 1, Catalogue; No. 2, General Information, Curriculums, Illustrations; Extra to No. 2, Presentation of the Pittsburgh Building; No. 3, Handbook; No. 4, Presentation of the '87 Gymnasium; Vol. 12, 1913, No. 1, Catalogue; Extra to No. 1, General Information; Supplement to No. 1, Graduate Work; No. 2, Photographic Reproductions; Supplement to No. 2, Chemical Engineering; No. 3, Laboratories; No. 4, General Information; Vol. 13, 1914, No. 1, Catalogue; No. 2, Commencement.

Report of the Committee appointed by a Public Meeting of the Citizens of Troy, on the Subject of Certain Proposed Improvements of the Rensselaer Polytechnic Institute. January 21, 1854. 8vo, 4 pp. Signed by Thomas W. Blatchford, J. M. Warren and John A. Griswold.

The Rensselaer Polytechnic Institute: Its Reorganization in

* See page 160.

1849–50; Its Condition at the Present Time; Its Plans and Hopes for the Future. By the Director of the Institute. Also, the Statement of a Committee, appointed by and of the Trustees of the Institute, for the Presentation of its Various Interests to the Citizens of Troy. May 10, 1856. 8vo, 87 pp.

The first part, written by B. Franklin Greene, includes 80 pages of the pamphlet; the statement of the committee and table of contents take up the remainder. The committee was composed of Hiram Slocum, John A. Griswold, Joseph M. Warren, Jonathan Edwards, Thomas C. Brinsmade, John B. Tibbits, Jonathan E. Whipple and B. Franklin Greene.

The "Transit," an annual issued under the auspices of the Fraternities. Volumes 1 to 49, extending from 1865 to 1914.

Memorial of the Rensselaer Polytechnic Institute, Troy, N. Y., to the Legislature of the State of New York, 1866. 8vo, 8 pp.

This was signed by all the members of the board of trustees and by Director Charles Drowne.

Report of a Committee of the Trustees of the Rensselaer Polytechnic Institute concerning the System of Instruction, with Proposed Modifications. 1870. 4to, 43 pp. E. Thompson Gale, Alexander L. Holley and Clarence E. Dutton, committee.

Papers relating to the Organization and to the First Regular Meeting of the Association of Graduates of the Rensselaer Polytechnic Institute, held at Troy, N. Y., June 22 and 23, 1869. 1870. 8vo, 24 pp.

History of the Winslow Laboratory. By Henry B. Nason. June 15, 1874. 8vo, 13 pp.

Proceedings of the Semi-centennial Celebration of the Rensselaer Polytechnic Institute, Troy, N. Y., held June 14–18, 1874, with Catalogue of Officers and Students, 1824–1874. 1875. 8vo, 223 pp.

This was edited by Henry B. Nason.

Meeting of Alumni in New York, February 18, 1881. Proceedings of the First Reunion of Graduates. 1881. 8vo, 30 pp.

The "Polytechnic," a publication issued by the students of the Institute each month during the scholastic year. February, 1885, to date (1914).

Biographical Record of the Officers and Graduates of the Rensselaer Polytechnic Institute, 1824–1886. By Henry B. Nason. 1887. 8vo, 614 pp.

Distant Examinations for Admission. Report of Alumni Committee and Petition to Board of Trustees. January, 1888. 8vo, 23 pp. Warren T. Kellogg, De Volson Wood, S. W. Barker, Richard P. Rothwell, P. H. Baermann, A. P. Boller and I. A. Stearns, committee.

Central R. P. I. Association. Constitution and By-laws. Edgar B. Kay, Secretary, February, 1888. 8vo, 8 pp.

Rensselaer Society of Engineers. List of Members, 1892. 8vo, 23 pp.

A Partial Record of the Work of Graduates of the Rensselaer Polytechnic Institute, Troy, N. Y. 1892. 8vo, 27 pp.

The Rensselaer Polytechnic Institute, Troy, N. Y., Founded 1824. Handbook of Information. 1893. 8vo, 23 pp.

The Rensselaer Polytechnic Institute, Troy, N. Y., Founded 1824. Handbook of Information. 1895. 8vo, 36 pp. Also, 1897, 8vo, 40 pp.

A Partial Record of the Work of Graduates of the Rensselaer Polytechnic Institute, Troy, N. Y., 1895. 8vo, 28 pp. Also, 1899. 8vo, 26 pp.

"Boletin del Instituto Politecnico de Rensselaer. Informacion General. Cursos. Vistas." Troy, N. Y., U.S.A., 1911. 8vo, 40 pp.

Proposed New Gymnasium for the Rensselaer Polytechnic Institute, Troy, N. Y., December, 1910. 8vo, 8 pp.

The Reports of the President to the Board of Trustees from May, 1901, to May, 1914, inclusive.

APPENDIX I

List of Subjects for Examination (1836)

See Page 87.

1. Extract the square root. Illustrate by diagram.

2. Find by the square root the length of a ladder placed against a wall 37 feet high, its bottom being 9 feet from the wall.

3. Demonstrate this application of the square root by trigonometry.

4. Find the distance across a river without instruments, by calculating a base frustrum of an isosceles triangle, pointing the apex to an object on the opposite shore.

5. Explain the legs and hypothenuse of a right-angled triangle within a circle; also with the vertical leg outside the circle.

6. Explain, by the rule of three, the proportion between the sides and angles of triangles. In this sines must be used as measures of degrees in working with degrees.

7. Illustrate the table of natural sines by a diagram.

8. Explain parallax generally.

9. Apply trigonometry to finding the moon's distance by its horizontal parallax.

10. Apply trigonometry to finding the sun's distance by the transit of Venus.

11. Apply the root and sines only in finding the height of a mountain, when the distance between the station and foot of the mountain is known, and angle at the base of the mountain between horizontal line and slant of hill.

12. Apply trigonometry to finding the length of a per-

pendicular of a right-angled triangle, the base and sum of the perpendicular and hypothenuse being given.

13. Scale and dividers with all the lines on the scale.

14. Explain carpenter's sliding rule.

15. Explain sector and its use in perspective drawing.

16. Explain pantograph.

17. Explain spirit levels.

18. Glass thermometer and common ditto.

19. Explain barometer.

20. Hydrometer.

21. Explain hygrometer.

22. Explain quadrant, circular and quarter circle.

23. Explain sextant.

24. Pluviometer applied to rain and snow.

25. Compass, surveyors and navigators.

26. Chains and tallies, and why 9 stakes and 7 tallies are preferable.

27. Explain harbor surveying.

28. Illustrate the manner of working a traverse by sea or land.

29. Traverse about a field; calculate the same by trapezoidal method.

30. Calculate the length of a degree of longitude at any degree of latitude.

31. Explain Mercator's chart.

32. Take the latitude of any place.

33. Take the longitude of any place.

34. Calculate the height of the atmosphere.

35. Calculate the pressure of the atmosphere upon any given surface on the earth by the barometer, say on a square yard.

36. Calculate the height of the lower valve of a pump at a given place by the barometer.

37. Cast the solid contents of a cone.

38. Cast the transverse diameter made by cutting an ellipse through the given frustrum of a cone.

39. Finish out a cone from a given frustrum.

Cement-Mixing Laboratory

Interior View, Chemical Laboratory

Machine Shop

Pattern Shop

40. Calculate a cask by assuming each end as a frustrum of a cone, without allowing for curvature.

41. Allowing for curvature, also the addition to the bung diameter of one tenth of the difference between bung and head.

42. Explain the method of calculating the angles of inflection in running a curve on a railroad when run on the periphery.

43. Explain the same when run by chord lines from one station.

44. Explain the method for calculating offsets from a chord line for fixing given equal points on a regular curve.

45. Show the method of calculating the quantity of water per second furnished by a running stream. Describe the best method for ascertaining the average velocity in a deep stream.

46. Illustrate contraction of the vein of water from an aperture.

47. Show that the velocity of effusions of apertures is increased as the square root of the height is increased; taking 4 feet head giving 16.2 feet velocity per second, calculations may be made almost accurately.

48. Apply formula for determining the velocity and cubic feet of effusion per second under a given head.

49. Apply formula for determining the velocity and cubic feet under a given head through given cylinder waterworks.

50. Apply formula for calculating the velocity in open raceways and canals.

51. Apply formula for calculating the velocity and quantity of water pitching over a waste weir or dam.

52. Calculate excavations for canals.

53. Calculate embankments, dykes, docks, etc.

Qualifications demanded of students of Civil Engineering in 1838–9. See page 88.

1. He must be familiar with the use of the level and

compass in laying out roads, McAdam roads, railroads, canals, etc.

2. He must be perfectly familiar with running courses, staking-out, and calculating for excavations and embankments.

3. He must be familiar with casting and constructing tables of versed sines; also the principles on which tables of natural sines are calculated, constructed, and used.

4. He must be familiar by practice with the calculations for filling and emptying locks, the supply of water by weight and measure which any stream will afford per second as a feeder, or for any hydraulic purpose.

5. He must be perfectly familiar with taking specific gravity of materials for construction.

6. He must be familiar by practice in calculating the power which any stream of water will give per second in propelling mills, factories, or other machinery, by measuring a trunk of it, and its descents.

7. He must be familiar by practice in calculating for waterworks whether conveyed in pipes, boxes, or open raceways.

8. He must be familiar with statics and dynamics, hydrostatics and hydrodynamics, so far as respects application to flumes, undershots and overshots, and descending raceways; also the velocities and efficient powers of spouting fluids, applied to driving machinery.

9. He must be familiar with the calculations of the quantity of grain ground by the rubbing areas of millstones, per minute or second.

10. He must be familiar with calculating the height of the atmosphere (as far as density will reflect), and its pressure on liquids in cases of pumps, and in all other cases where its pressure influences mechanical operations.

11. He must be familiar with casting the heights of nimbose clouds by lightning, also of the cirrose and cirrocumulose by two stations, when the fitting of lightning rods, etc., are concerned.

12. He must be perfectly familiar with taking and calculating latitude by the sun, moon, and north star.

13. He must be familiar with taking longitude by lunar observations, by eclipses of the sun and moon, and by eclipses of Jupiter's satellites.

14. He must be perfectly familiar with taking the heights of hills and mountains with the barometer and thermometer, also in taking extemporaneous surveys and profiles with the barometer and triangular spans.

15. He must be qualified by practice to fix a transit line whenever required.

16. He must be qualified by practice to determine the variation of the needle at any time and place, very nearly.

17. He must be qualified by practice to make a topographical survey of a State, county, etc., by fixing a base line, on the ice of a lake, river, or a natural plane of earth, also to extend surveys from the base line to the required points, by triangular spans.

18. He must be qualified to change spherical areas of large districts, taken by latitude and longitude, into rectangular areas, by Mercator's method.

19. He must be a practical land surveyor, in theory and practice.

20. He must be a practical geologist, so far as to be able to make a correct report of the rocky and earthy deposits through which he lays out a canal, railroad, etc., also so far as to enable him to judge of inorganic materials for construction.

21. He must be so far a botanist and botanical physiologist as to be able to judge of timber, earthy mould, etc., which (having once been organized) are subject to chemical decomposition—consequently dissolution.

22. He must be so far versed in architecture as to be enabled to direct the construction of bridges and other works of engineering, in a comely style.

23. He must be so far familiar in plotting and business

drafting as to perform all ordinary operations required in engineering. The most finished perspective and other ornamental drawings are not required of the engineer, but are very desirable.

APPENDIX II

Schedule of the Course in Civil Engineering (1854)

FIRST YEAR

First Term

Mathematics	Algebra—Geometry.
General Physics	Molecular Forces—Thermotics.
Graphics	Geometrical Drawing: *Elementary Drawing.*
Geodesy	Line Surveying: *Theory* (Commenced); *Field Work.*
English Composition	The Course (Commenced).
French Language	The Course: *French Grammar.*

Second Term

Mathematics	Trigonometry—Higher Algebra.
General Chemistry	Non-metallic Chemistry.
Graphics	Topographical Drawing: *General Topography; Maps of Farm Surveys.*
Geodesy	Line Surveying: *Theory* (Finished); *Office Work.*
Natural History	Botany.
English Composition	The Course (Continued).
French Language	The Course: *Translations from French into English.*

SECOND YEAR

First Term

Mathematics	Analytical Geometry—Differential Calculus.
General Physics	Electricity.

General Chemistry	Metallic Chemistry.
Natural History	Mineralogy.
Graphics	Descriptive Geometry: *General Theory*—Geometrical Drawing: *Architectural Drawing.*
Geodesy	Practical Trigonometry.
English Composition	The Course (Continued).
French Language	The Course: *Reading from French Scientific Authors.*
German Language	The Course: *German Grammar.*

SECOND TERM

Mathematics	Integral Calculus.
General Physics	Acoustics—Optics.
Natural History	Zoology.
Geology and Physical Geography	Geology.
Graphics	Descriptive Geometry: *Shades and Shadows*—Geometrical Drawing: *Machine Drawing.*
Geodesy	Topographical Surveying—Hydrographical Surveying.
English Composition	The Course (Continued).
German Language	The Course: *Translations from German into English.*

THIRD YEAR

FIRST TERM

Mechanics	Mechanics of Solids—Mechanics of Fluids.
Practical Astronomy	The Course (Commenced).
Physical Geography	The Course.
Practical Geology	The Course.
Geodesy	Trigonometrical Surveying.
Graphics	Descriptive Geometry: *Perspective; Isometrical Projection* — Topographical Drawing: *Maps of Trigonometrical Surveys.*
Machines	Theory of Machines.
Industrial Physics	Practical Pneumatics—Practical Thermotics.
Philosophy of Mind	The Course (Commenced).
English Composition	The Course (Finished).

SECOND TERM

Constructions	Theory of Structures—General Constructions—Bridges—Hydraulic Works—Railways.
Machines	Prime Movers—Special Machines.
Mining	The Course.
Practical Astronomy	The Course (Finished).
Geodesy	Railway Surveying—Mine Surveying.
Graphics	Descriptive Geometry: *Stone Cutting*—Topographical Drawing: *Maps, etc., of Railway Surveys; Plans, etc., of Mine Surveys.*
Metallurgy	General Metallurgy—Metallurgy of Iron.
Industrial Physics	Architectural Physics.
Philosophy of Mind	The Course (Finished).

SCHEDULE OF THE COURSE IN NATURAL SCIENCE (1854)

FIRST YEAR

The course for the first year is the same as that in Civil Engineering.

SECOND YEAR

FIRST TERM

General Physics	Electricity.
General Chemistry	Metallic Chemistry.
Natural History	Mineralogy.
Geology and Physical Geography	Physical Geography.
Practical Geology	The Course.
Graphics	Geometrical Drawing: *Architectural.*
Industrial Physics	Practical Pneumatics—Practical Thermotics.
Philosophy of Mind	The Course (Commenced).
English Composition	The Course (Finished).
French Language	The Course: *Reading French Scientific Authors.*
German Language	The Course: *German Grammar.*

SECOND TERM

Natural History	Zoology.
Geology and Physical Geography	Geology.

General Chemistry	Organic Chemistry.
Natural History Applied to the Arts	The Course.
General Physics	Acoustics—Optics.
Industrial Physics	Architectural Physics.
Philosophy of Mind	The Course (Finished).
German Language	The Course: *Translations from German into English.*

Schedule of the Two Last Years of the Course in Mining Engineering (1866)

DIVISION B

First Term

Mathematics	Differential Calculus—Integral Calculus —Method of Least Squares.
Physics	Electricity: *Terrestrial Magnetism; Statical and Dynamical Electricity.*
Chemistry	Qualitative Analysis: *Behavior of bases and acids with reagents.*
Natural History	Mineralogy.
German Language	German Grammar—English Translations.
Geodesy	Practical Trigonometry — Levelling — Topographical Surveying.
Geometrical Drawing	Machine Drawing: *Elements of Machines.*
Topographical Drawing	Maps of Topographical Surveys.

Second Term

Rational Mechanics	Mechanics of Solids — Mechanics of Fluids.
Descriptive Geometry	Linear Perspective.
Physics	Acoustics and Optics.
Chemistry	Qualitative Analysis.
Natural History	Mineralogy—Geology—Zoology—Palæontology.
German Language	English Translations.
Geometrical Drawing	Perspective.
Topographical Drawing	Colored Topography.

DIVISION A

First Term

Physical Mechanics........	Mechanics of Solids: *Friction; Strength of Materials.* Mechanics of Fluids: *Practical Hydraulics; Practical Pneumatics.*
Machines.................	Theory of Machines.
Descriptive Geometry......	Stone Cutting.
Chemistry................	Qualitative Analysis—Metallurgy.
Natural History...........	Mineralogy—Geology.
Philosophy...............	Intellectual Philosophy.
Geometrical Drawing......	Stone Cutting.

Second Term

Machines.................	Theory of Prime Movers: *Steam Engine.* Designs for and Reviews of Special Machines.
Chemistry................	Quantitative Analysis—Metallurgy—Assaying.
Geodesy..................	Mine Surveying.
Practical Mining..........	Sinking and Driving—Ventilation and Drainage—General Management.
Philosophy................	Ethical Philosophy.

Schedule of the Course in Civil Engineering

(1914)

FIRST YEAR

First Term	Second Term
Chemistry, Theory.	Trigonometry.
Chemistry, Lectures.	Analytical Geometry, Plane.
Algebra.	Mensuration.
French.	French.
Projections, Theory.	Surveying, Theory.
Projections, Drawing.	Surveying, Practice.
Freehand Drawing.	Topographical Drawing.
Elements of Drawing.	Mechanical Drawing.
Lettering.	

A Thesis must be written during the Summer Vacation.

SECOND YEAR

First Term	Second Term
Analytical Geometry, Solid.	Descriptive Geometry, Theory.
Differential Calculus.	Descriptive Geometry, Drawing.
Integral Calculus.	Shades and Shadows, Theory.
Surveying, Theory.	Shades and Shadows, Drawing.
Surveying, Practice.	Perspective, Theory.
Chemistry, Qualitative Analysis.	Perspective, Drawing.
English Language.	Surveying, Theory.
	Chemistry, Qualitative Analysis.
	Physics.
	Freehand Drawing.

A Thesis must be written during the Summer Vacation.

A three weeks' course in Topographical and Hydrographical Surveying is required during June and July.

THIRD YEAR

First Term	Second Term
Surveying, Practice.	Mechanics, Rational.
Geodesy.	Structures.
Electricity, Theory.	Resistance of Materials.
Electricity, Laboratory Work.	Descriptive Astronomy.
Steam Engineering.	Railroad Curves, Theory.
Mechanics, Rational.	Metallurgy.
Highways.	Mineralogy.
Stone Cutting, Theory.	Assaying.
Stone Cutting, Drawing.	Materials Testing, Laboratory Work.
Botany.	
Map Drawing.	
Physics, Laboratory Work.	

A Thesis must be written during the Summer Vacation.

A three weeks' course in Railroad Engineering practice is required during August and September.

FOURTH YEAR

First Term	Second Term
Hydraulics.	Hydraulics.
Sewerage.	Hydraulic Motors.
Bridges and Roofs.	Bridge Design.
Spherical Astronomy.	Electrical Laboratory Work.
Practical Astronomy.	Mechanical Laboratory Work.

FOURTH YEAR (*Continued*)

First Term

Railroad Engineering.
Electrodynamics.

Second Term

Thermodynamics.
Machine Construction, Theory.
Machine Construction, Drawing.
Geology.
Law of Contracts.

A Graduating Thesis must be presented.

Schedule of the Course in Mechanical Engineering

(1914)

FIRST YEAR

First Term

Chemistry, Theory.
Chemistry, Lectures.
Algebra.
French.
Projections, Theory.
Projections, Drawing.
Freehand Drawing.
Elements of Drawing.
Lettering.

Second Term

Trigonometry.
Analytical Geometry, Plane.
Mensuration.
French.
Surveying, Theory.
Surveying, Practice.
Mechanical Drawing.
Steam Engineering.
Physics.

A Thesis must be written during the Summer Vacation.

Four weeks' Shop Work is required during the Summer Vacation.

SECOND YEAR

First Term

Analytical Geometry, Solid.
Differential Calculus.
Integral Calculus.
Chemistry, Qualitative Analysis.
English Language.
Electricity, Theory.
Electrical Laboratory Work.

Second Term

Descriptive Geometry, Theory.
Descriptive Geometry, Drawing.
Chemistry, Qualitative Analysis.
Physics, Theory.
Physics, Laboratory.
Machine Drawing.
Kinematics.
Electrical Laboratory Work.

A Thesis must be written during the Summer Vacation.

Four weeks' Shop Work is required during the Summer Vacation.

THIRD YEAR

First Term	Second Term
Thermodynamics.	Mechanics, Rational.
Mechanical Laboratory.	Heat Engines.
Graphics of Machines.	Structures.
Mechanics, Rational.	Resistance of Materials.
Boilers.	Alternating Current Electric Machines, Theory.
Direct Current Electric Machines, Theory.	Alternating Current Electric Machines, Laboratory Work.
Direct Current Electric Machines, Laboratory Work.	Metallurgy.
Botany.	

A Thesis must be written during the Summer Vacation

FOURTH YEAR

First Term	Second Term
Boiler Design.	Hydraulic Motors.
Steam Engine and Steam Turbine Design.	Pumping Machinery.
Ventilation, Heating and Refrigeration.	Steam Engine and Steam Turbine Design.
Hydraulics, Theory.	Central Stations.
Hydraulic Machinery.	Machine Design.
Mechanical Laboratory.	Contracts.
Transmission and Distribution of Electricity, Theory.	Gas and Oil Engine Design.
Alternating Current Electric Machines, Laboratory.	Office Work.
Metallurgy.	Mechanical Laboratory.
Marine Engineering and Naval Architecture.	Descriptive Astronomy.
	Law of Contracts.

A Graduating Thesis must be presented.

Schedule of the Course in Electrical Engineering

(1914)

FIRST YEAR

First Term	Second Term
Chemistry, Theory.	Trigonometry.
Chemistry, Lectures.	Analytical Geometry, Plane.
Algebra.	Mensuration.
French.	French.

FIRST YEAR (*Continued*)

First Term	Second Term
Projections, Theory.	Surveying, Theory.
Projections, Drawing.	Surveying, Practice.
Freehand Drawing.	Mechanical Drawing.
Elements of Drawing.	Steam Engineering.
Lettering.	Physics.

A Thesis must be written during the Summer Vacation.

Four weeks' Shop Work is required during the Summer Vacation.

SECOND YEAR

First Term	Second Term
Analytical Geometry, Solid.	Physics, Theory.
Differential Calculus.	Physics, Laboratory Work.
Integral Calculus.	Electricity, Laboratory Work.
Chemistry, Qualitative Analysis.	Descriptive Geometry, Theory.
Electricity, Theory.	Descriptive Geometry, Drawing.
Electricity, Laboratory Work.	Chemistry, Qualitative Analysis.
English Language.	Machine Drawing.
	Kinematics.

A Thesis must be written during the Summer Vacation.

Four weeks' Shop Work is required during the Summer Vacation.

THIRD YEAR

First Term	Second Term
Direct Current Electric Machines, Theory.	Alternating Current Electric Machines, Theory.
Direct Current Electric Machines, Laboratory Work.	Alternating Current Electric Machines, Laboratory Work.
Direct Current Electric Machines, Design.	Mechanics, Rational.
Mechanics, Rational.	Resistance of Materials.
Thermodynamics.	Structures.
Boilers.	Heat Engines.
Electrical Measurements.	Metallurgy.

A Thesis must be written during the Summer Vacation.

FOURTH YEAR

First Term	Second Term
Alternating Current Electric Machines, Laboratory Work.	Transmission and Distribution of Electricity, Design.
Alternating Current Electric Machines, Design.	Electric Railway and Lighting Systems, Design.

FOURTH YEAR (*Continued*)

First Term

Transmission and Distribution of Electricity, Theory.
Electric Railway and Lighting Systems, Theory.
Electrochemistry, Theory.
Electrochemistry, Laboratory.
Railroad Location.
Hydraulics.
Mechanical Laboratory.

Second Term

Electric Railway and Lighting Systems, Laboratory.
Transmission and Distribution of Electricity, Laboratory.
Telephones and Telegraphy.
Materials of Electrical Engineering.
Electromagnetics, Theory.
Central Stations, Theory.
Central Stations, Design.
Law of Contracts.

A Graduating Thesis must be presented.

Schedule of the Course in Chemical Engineering

(1914)

FIRST YEAR

First Term

Chemistry, Theory.
Chemistry, Lectures.
Algebra.
French.
Projections, Theory.
Projections, Drawing.
Freehand Drawing.
Elements of Drawing.
Lettering.

Second Term

Chemistry, Qualitative Analysis.
Trigonometry
Analytical Geometry, Plane.
Mensuration.
French.
Physics.

A Thesis must be written during the Summer Vacation.

SECOND YEAR

First Term

Chemistry, Quantitative Analysis.
Analytical Geometry, Solid.
Differential Calculus.
Integral Calculus.
Electricity.
English Language.

Second Term

Chemistry, Quantitative Analysis.
Chemistry, Advanced Inorganic.
Physics.
Physical Measurements.
Physical Laboratory Work.
Electrical Measurements.

A Thesis must be written during the Summer Vacation.

THIRD YEAR

First Term

Chemistry, Organic, Theory.
Chemistry, Organic, Laboratory Work.
Gas and Fuel Analysis.
Direct Current Electrical Machines, Theory.
Direct Current Electrical Machines, Laboratory Work.
Mechanics, Rational.
Metallurgy.

Second Term

Chemistry, Physical.
Thermodynamics.
Mechanics, Rational.
Structures.
Resistance of Materials.
Materials Testing, Laboratory Work.
Mineralogy.

A Thesis must be written during the Summer Vacation.

FOURTH YEAR

First Term

Chemistry, Industrial.
Electrochemistry, Theory.
Electrochemistry, Laboratory Work.
Steam Engines.
Hydraulics.
Water Analysis.
Microscopy.

Second Term

Alternating Current Electrical Machines, Design.
Alternating Current Electrical Machines, Laboratory Work.
Central Stations, Mechanical Equipment.
Central Stations, Electrical Equipment.
Machine Construction, Theory.
Machine Construction, Drawing.
Mechanical Laboratory.
Water Supply.
Assaying.
Law of Contracts.

A Graduating Thesis must be presented.

Schedule of the Course in General Science (1914)

FIRST YEAR

First Term

Chemistry, Theory.
Algebra.
French.
Projections, Theory.
Projections, Drawing.

Second Term

Trigonometry.
Analytical Geometry, Plane.
Mensuration.
French.
Chemistry, Qualitative Analysis.

FIRST YEAR (*Continued*)

First Term	Second Term
Freehand Drawing.	
Elements of Drawing.	
Lettering.	

A Thesis must be written during the Summer Vacation.

SECOND YEAR

First Term	Second Term
Analytical Geometry, Solid.	Physics, Theory.
Differential Calculus.	Physical Laboratory and Electrical Measurements.
Integral Calculus.	Chemistry, Quantitative Analysis, Theory.
English.	Chemistry, Quantitative Analysis, Laboratory.
Electricity, Theory.	Advanced Inorganic Chemistry, Recitations.
Chemistry, Quantitative Analysis, Theory.	Advanced Inorganic Chemistry, Lectures.
Chemistry, Quantitative Analysis, Laboratory.	

A Thesis must be written during the Summer Vacation.

THIRD YEAR

First Term	Second Term
Organic Chemistry, Theory.	Physical Chemical Laboratory Work.
Organic Chemistry, Laboratory Work.	Chemistry, Industrial, Nonmetallic.
Direct Current Electrical Machines, Theory.	Alternating Current Electrical Machines, Theory.
Direct Current Electrical Machines, Laboratory.	Alternating Current Electrical Machines, Laboratory.
Gas and Fuel Analysis.	Metallurgy.
	Mineralogy.

A Thesis must be written during the Summer Vacation.

FOURTH YEAR

First Term	Second Term
Microscopy.	Steam Engines.
Water Analysis.	Mechanical Laboratory Work.
Electrochemistry, Theory.	Thermodynamics.
Electrochemistry, Laboratory.	Geology.
Chemistry, Industrial.	Assaying.
Chemistry, Organic, Laboratory.	
Direct Current Electrical Machines.	

A Graduating Thesis must be presented.

APPENDIX III

Names of the Grand Marshals since the Foundation of the Office. There were no Grand Marshals for the Classes '91, '92, '93, and '94.

*Albert M. Harper, '66, ΔΦ; *Frank J. Hearne, '67, ΔΦ; Virgil G. Bogue, '68, ΔKE; *John Pierpont, '69, ΔKE; Thomas O'N. Morris, '70, ΔΦ; George C. MacGregor, '71, ZΨ; David Reeves, '72, ΔΦ; Daniel A. Tompkins, '73; James N. Caldwell, '74, R.S.E.; *William L. Fox, '75, ΔΦ, Morris S. Verner, '76, ZΨ; *Coddington Billings, Jr., '77, R.S.E.; George S. Davison, '78; *Robert R. Bridgers, '79, R.S.E.; *Frederick S. Young, '80, ΔΦ; Thomas D. Whistler, '81, ΔΦ; Independence Grove, '82, XΦ; Robert J. Pratt, '83, R.S.E.; William A. Aycrigg, '84, XΦ; Leverett S. Miller, '85, ΔΦ; Edward B. Ashby, '86, ZΨ; †James B. Larrowe, '86, ΘΞ; *Halsey B. Pomeroy, '87, R.S.E.; James M. Africa, '88, ΔKE; Paul O. Hebert, '89, ΔTΔ; William Easby, Jr., '90; *Athol M. Miller, '95, ΔΦ; Henry B. Voorhees, '96, ΔKE; Charles J. McDonough, '97, ΘΔX; Thomas R. Lawson, '98, ΘΞ; Gustav A. Keller, '99, R.S.E.; Parley L. Williams, '00, XΦ; James W. Davis, '01, D.K.E.; William H. Young, '02, XΦ; Edward W. Banker, '03, ΔΦ; Homer G. Whitmore, '04, R.S.E.; Cuyler W. Lush, '05; William S. Lozier, '06, R.S.E.; Herman S. Chalfant, '07, ΔΦ; Horace W. Rinearson, '08, R.S.E.; Robert A. Searle, '09, ΔKE; Carl W. Schedler, '10, R.S.E.; James T. Ganson, '11, ΔKE; Frank B. Watkins, '12, R.S.E.; Edward D. P. Gross, '13, ΔΦ; Philip C. Rummel, Jr., '14 R.S.E.; Glenn W. Tisdale, '15, ΔKE.

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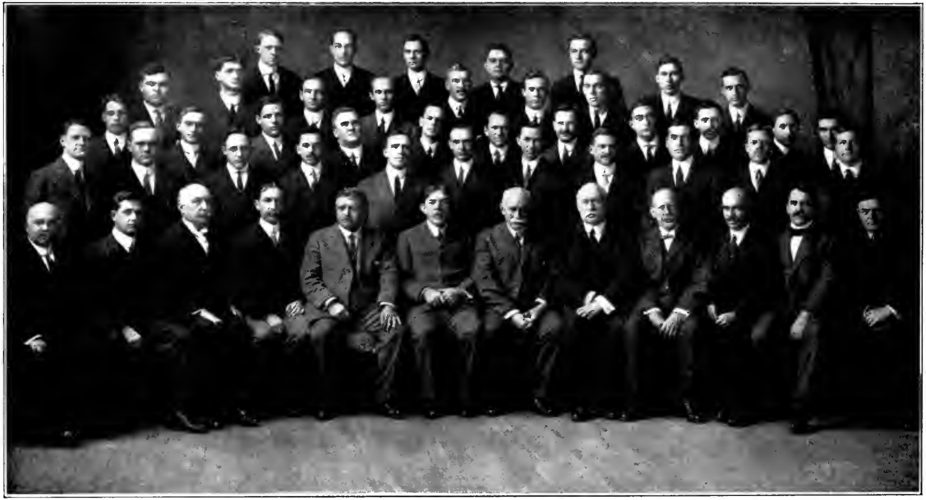
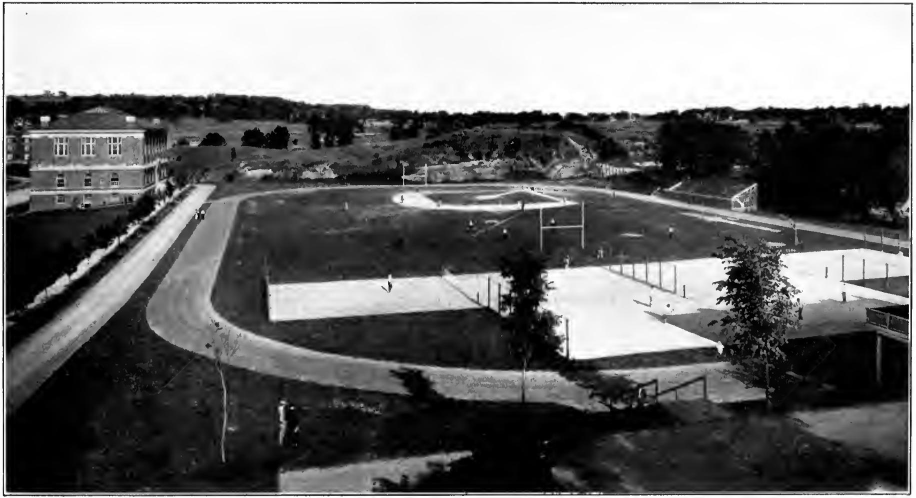
* Deceased.

† Left the Institute before graduation.



Some Members of the Faculty, 1912



'86 Athletic Field and '87 Gymnasium

APPENDIX IV

DESCRIPTION OF THE LABORATORIES IN THE SAGE BUILDING

Mechanical Laboratories

The Mechanical Laboratory is divided into several parts: the steam, hydraulic, internal combustion and fan and blower laboratories, beside a number of smaller ones for experiments in heating and ventilation, the testing of oils and fuels, the standardization of instruments and the testing of apparatus.

The steam laboratory contains a cross-compound Corliss engine, especially built for investigation, a two-stage air compressor, a vertical high-speed compound engine, three modern high-speed single cylinder engines, and three steam turbines. Each engine unit has its own condenser and the condensers are equipped with different types of air pumps. There are direct steam-driven air and circulating pumps and valveless air pumps of the Edwards design and the Mullen design. A Foster superheater is connected to the turbines, but this is so installed that it may be moved to any part of the laboratory and used with other units. The Corliss engine is so arranged that the cranks may be set at different angles and the strokes of the two sides may be varied, thus changing the volume ratio of the two cylinders from 1 : 3 to 1 : 7. In addition, the high pressure steam and exhaust chests are so divided that the two ends of the engine may be operated independently and the steam condensed in separate condensers. The condensers of this engine have a dry-air pump to illustrate this type of condenser equipment. All these machines, as well as others sent to the laboratory for investigation, may be moved by travelling cranes provided for this purpose.

The hydraulic laboratory contains pumps, turbines and apparatus for determining the losses in machines and water-carrying devices, for calibrating instruments and for the

measurement of water. The pump equipment includes a simplex steam pump, a 1,000 gallon per minute tank pump, a compound steam-driven duplex pump for high pressure service and for duty tests, and, in addition to these, there are three centrifugal pumps of one, two and three stages respectively, a rotary pump, a triplex pump and a pulsometer. The centrifugal, triplex and rotary pumps are motor-driven, each motor being equipped with ammeters and voltmeters so that the power used may be ascertained. The hydraulic motors are represented by a Francis turbine of Leffel make, and three impulse wheels of the Doble, Pelton and Escher-Wyss varieties. These wheels are arranged so that the quantity of water may be measured by calibrated nozzles, weirs, or by Venturi meters. The calibration of these pieces of apparatus may be carried out in the laboratory. Air tanks are used to steady the discharge from the various pumps and a small motor-driven air-compressor is used to furnish the air. There is also a flume, with chronograph and standard clock, for testing current meters and ship models, and facilities for testing Pitot tubes and water meters are also provided.

The internal combustion and refrigeration laboratory is equipped with four gas engines and two kerosene engines, two hot air engines and a two-ton refrigerating and ice-making plant. The gas engines are of different types. One operates on produced gas and is connected to a suction producer, one is operated on illuminating gas while the other two may operate on gas or gasolene. The two kerosene engines illustrate this form of internal combustion engine. The hot air engines of the Ericsson and Ryder-Ericsson types are installed to show how these machines are constructed. The refrigerating plant contains a steam-driven ammonia compressor with a two-pipe condenser and a three-pipe brine cooler and the refrigerating room may be cooled by direct expansion or by brine.

The fan laboratory is equipped with rotary blowers, exhausters, pressure fans, and a two-stage fan as well as a

ventilator. These are all motor-driven and so arranged that the power input may be determined. The transmission laboratory contains transmission dynamometers and absorption brakes to determine the efficiency of rope and belt transmission; also a hydraulic ram and apparatus for testing injectors. On the same floor there is a small Corliss engine and a small slide valve engine for practice in valve setting, an instrument room for indicators, gauges, and other instruments and a machine shop equipped with machine-driven tools.

There are a number of small rooms, used for testing various materials of engineering and the calibration of instruments, on the first floor of the building above the two laboratory floors. The hoist room is equipped for testing various forms of hoists and jacks; the heating and ventilation room with direct and indirect radiators and a fan; the anemometer and tachometer room and the gauge and indicator room each with special devices to test the apparatus contained in it and the oil and fuel room with a coefficient of friction oil testing machine, viscosimeters, flash and chill point apparatus, Elliott, Hempel, and Orsat gas apparatus, Junker and Mahler calorimeters, balances, chemical apparatus, ovens and other apparatus for determining the physical and chemical properties of fuels and oils. A standard room contains high grade apparatus for use in the laboratory or for comparison.

Electrical and Physical Laboratories

The Electrical laboratories obtain both direct and alternating current from the mains of the Troy Electric Light Company, a total of 150 kilowatts being available from this source. The alternating current is supplied at 2,400 volts, two phase, 40 cycles and is transformed to 200 volts by six subway type transformers. The laboratories contain the necessary ballistic and aperiodic galvanometers, bridges, standard cells, condensers, resistance coils, induc-

tion coils, ammeters, voltmeters, and wattmeters, as well as various types of Wheatstone bridges, galvanometers, condensers, a complete set of Reichsanstalt standard resistances, a Du Bois magnetic balance, conductivity bridges, a cable testing set, potentiometers, and standards of self-induction.

There is also a generator plant equipped with two 25 kilowatt 110 volt direct-connected generators, one of which is driven by a Cross compound marine type engine and the other by a Curtis steam turbine. In addition to these generators there are two 25 kilowatt synchronous motor driven 110 volt generators for supplying direct current, two 25 kilowatt motor generator sets supplying 3 phase current, one at 60 cycles and the other at 25 cycles, a 15 kilowatt induction motor driven exciter set with a Tirrell regulator, a 25 kilowatt three unit set consisting of an induction motor connected to two low voltage direct current generators supplying for electrolytic and standardization purposes 3,000 amperes at 8 volts or 1,500 amperes at 16 volts, and a 30 ampere mercury arc rectifier.

The battery room contains 66 cells, each of 120 ampere hours' capacity, and four cells, each of 4,000 ampere hours' capacity. Three rooms are used for work in electrochemistry. The equipment includes a 50 kilowatt Heroult furnace and a 10 kilowatt induction furnace of the Colby-Kjellin type, an experimental Arsem furnace and an Acheson furnace.

The dynamo room is devoted to the testing of generators and motors. The machines are of great variety and include one Edison 3 kilowatt 110 volt direct current generator, one Western Electric 5 kilowatt direct current generator, two 6 kilowatt Allis Chalmers direct-current generators, one Crocker Wheeler dynamotor for electrolytic work, one General Electric 7.5 kilowatt three phase alternator, one General Electric 7.5 kilowatt two phase alternator with motor-driven exciter, and two 10-kilowatt Westinghouse 550 volt rotary converters. In addition to several small motors the equipment includes an electric railway motor

testing set consisting of two 25 horse-power 550 volt motors mounted on an interurban track, with friction wheels, fly-wheels, water brakes, and traction dynamometer, air- and hand-brakes and a full equipment of instruments for a complete series of tests; two Westinghouse 10 horse-power type K induction motors, one General Electric 7.5 horse-power type L induction motor, one General Electric 3 horse-power single-phase induction motor, one Lincoln 7.5 horse-power variable speed motor, one Electrodynamic Company's interpole variable speed motor, one Westinghouse 7.5 horse-power 110 volt compound wound motor, and one General Electric 5 horse-power series motor.

The instrument shop is used for the repair and construction of apparatus. The equipment includes a 14-inch Hendey lathe, a 15-inch Potter and Johnston shaper, a Dwight-Slate sensitive drill, a Northern Electric buffer, a gas-forge and an overhead travelling crane. All the tools are motor-driven.

The equipment of the high tension room comprises two General Electric 5 kilowatt 2,200 volt static transformers, one General Electric constant current floating coil transformer, two Westinghouse 1 kilowatt 2,200 volt static transformers, and two Westinghouse 10 kilowatt 10,000 volt transformers; also induction coils and other necessary apparatus for experiments in wireless telegraphy and X-rays.

The large laboratory devoted to general physics, heat, and sound, adjoins the room used for the study of light. This room is so connected to the adjoining rooms for photometric measurements and electric design, that a photometer bench 140 feet long can be obtained for the measurement of powerful light sources. The photometer rooms are equipped with Reichsanstalt photometers and have all the necessary attachments for standardizing and measuring mean horizontal or mean spherical candle-power of arc and incandescent electric lights and other light sources. There is also a room for physical research and a large drawing room for electric design.

The laboratory contains also a cathetometer, dividing engine, astronomical clock, chronograph, standard barometers, five Becker and two Sartorius balances, special apparatus for measuring the modulus of elasticity, modulus of torsion, and coefficient of expansion, Barus calorimeter, Chatelier pyrometer, Hilger spectrometer; Zeiss spectrometer, Rowland plane and concave gratings, Schmidt and Haensch polariscopes, Zeiss microscope, Abbe refractometer, and Michelson interferometer.

APPENDIX V

Names of the Successful Competitors for the Macdonald Prize

Stacey E. Denny, C.E., 1891; *Elmer J. Bucknell, C.E., 1892; Ralph H. Chambers, C.E., 1893; Paul L. Reed, C.E., 1894; *Myron E. Evans, C.E., 1895; Henry B. Voorhees, C.E., 1896; Howard W. Mesnard, C.E., 1897; James A. S. Redfield, C.E., 1898; Julius W. Pfau, C.E., 1899; John H. Campbell, C.E., 1900; Carl A. Bostrom, C.E., 1901; John W. Doty, C.E., 1902; C. W. Tillinghast Barker, C.E., 1903; Henry R. Beebe, C.E., 1904; Cuyler W. Lush, C.E., 1905; Jay A. Auringer, C.E., 1906; George M. Ward, C.E., 1907; Charles E. Reinicker, C.E., 1908; Byron V. Herden, C.E., 1909; Tandy A. Bryson, C.E., 1910; Charles Jay Seibert, C.E., 1911; Charles P. Rumpf, C.E., 1912; Ralph W. Hewes, C.E., 1913.

APPENDIX VI

Presidents of the General Alumni Association Since its Organization at Troy, June 22, 1869

*James Hall, '32, 1869–71; *Albert R. Fox, '30, 1871–73; *Strickland Kneass, '39, 1873–74; *William Gurley, '39, 1874–78; *John G. Ambler, '33, 1878–79; *James P. Wallace,

* Deceased.

'37, 1879–80; *Francis Collingwood, '55, 1880–81; Charles Macdonald, '57, 1881–83; *Charles C. Martin, '56, 1883–84; *Joseph M. Wilson, '58, 1884–85; *Joseph C. Platt, '66, 1885–86; David Reeves, '72, 1886–87; Theodore Voorhees, '69, 1887–88; *T. Guilford Smith, '61, 1888–89; *Christopher C. Waite, '64, 1889–90; John J. Albright, '68, 1890–91; *Clark Fisher, '58, 1891–92; William B. Cogswell, '51, 1892–93; Theodore N. Ely, '66, 1893–94; *William Metcalf, '58, 1894–95; *William H. Doughty, '58, 1895–96; Joseph M. Knap, '58, 1896–98; *Alexander J. Cassatt, '59, 1898–99; *Frederick Grinnell, '55, 1899–00; *Charles C. Martin, '56, 1900–01; Horace G. Young, '77, 1901–02; Washington A. Roebling, '57, 1902–03; Robert Forsyth, '69, 1903–04; Alfred H. Renshaw, '83, 1904–05; *Alfred P. Boller, '61, 1905–06; Morris R. Sherrerd, '86, 1906–07; William B. Ridgely, '79, 1907–08; Philip W. Henry, '87, 1908–09; George S. Davison, '78, 1909–10; Calvin Pardee, '60, 1910–11; Thomas H. Walbridge, '76, 1911–12; Nelson P. Lewis, '79, 1912–13; Charles Sooysmith, '76, 1913–14; Strickland L. Kneass, '80, 1914–.

APPENDIX VII

Total Assets for the Years 1902 to 1914 Inclusive

Year	Grounds, Buildings and Contents	Investments and Cash	Total Assets
1902	$240,000	$248,000	$488,000
1903	245,000	289,000	534,000
1904	280,000	300,000	580,000
1905	247,000	553,000	800,000
1906	383,500	632,800	1,016,300
1907	605,800	724,800	1,330,600
1908	697,000	1,612,100	2,309,100
1909	1,033,200	1,360,100	2,393,300
1910	1,153,000	1,393,100	2,546,100
1911	1,213,500	1,363,300	2,576,800
1912	1,322,600	1,359,400	2,682,000
1913	1,436,500	1,376,700	2,813,200
1914	1,505,100	1,347,400	†2,852,500

* Deceased. † See page 177.

APPENDIX VIII

Number of Students and Graduates for the Years 1863–1914 Inclusive

TABLE I

Year	Total Number of Students	Number Catalogued in Division D	Number of Students Graduated
1863	96	46	12
1864	130	54	6
1865	167	59	12
1866	155	44	17
1867	154	42	25
1868	147	43	22
1869	135	45	20
1870	145	51	20
1871	151	53	26
1872	178	69	17
1873	209	83	21
1874	181	52	11
1875	181	56	24
1876	186	39	32
1877	160	41	27
1878	160	32	33
1879	103	24	31
1880	104	39	18
1881	108	38	20
1882	172	83	18
1883	218	73	15
1884	233	70	23
1885	234	40	31
1886	164	53	48
1887	154	53	42
1888	164	64	31
1889	174	54	18
1890	189	66	19
1891	183	72	31
1892	206	101	34
1893	188	88	19
1894	165	82	37
1895	135	61	28
1896	137	48	14
1897	138	57	23
1898	143	68	27
1899	175	91	19
1900	225	121	21
1901	249	114	21
1902	314	151	21
1903	375	207	44
1904	387	189	53
1905	426	203	35

TABLE I (*Continued*)

Year	Total Number of Students	Number Catalogued in Division D	Number of Students Graduated
1906	485	242	42
1907	609	36	68
1908	667	367	57
1909	672	332	80
1910	655	247	56
1911	643	241	71
1912	620	253	118
1913	626	293	108
1914	...	...	87

Distribution of students in departments and classes in the year 1913–14.

TABLE II

Class	C.E.	M.E.	E.E.	Ch.E.	B.S.	Total
A	55	10	16	0	3	84
B	63	14	17	2	2	98
C	55	20	23	1	2	101
D	135	64	67	18	9	293
Total	308	108	123	21	16	576
Special Students						48
Graduate Students						2
Total						626

Number of graduates in the different departments in the years 1911–14, inclusive.

TABLE III

Year	C.E.	M.E.	E.E.	B.S.	Total
1911	59	3	9	0	71
1912	96	9	13	0	118
1913	73	16	18	1	108
1914	57	10	17	3	*87

* One graduate student took a masters' degree making the total number 88.

Number of students and teachers for the years 1904–14, inclusive.

TABLE IV

Catalogue of	04	05	06	07	08	09	10	11	12	13	14
Professors..	10	10	10	12	12	13	15	15	15	19	19
Asst. Profs..	3	3	3	3	3	5	4	5	5	4	5
Instructors.	0	2	2	1	2	3	4	4	4	24	25
Assistants..	6	7	10	10	19	22	26	30	33	11	9
Temp.Assts.	1	1	2	3	3	4	0	0	0	0	0
Lecturers...	1	1	1	3	3	8	7	7	6	5	5
Teachers...	21	24	28	32	42	55	56	61	63	63	63
Students...	375	387	426	485	609	667	672	655	643	620	626
Ratio......	18	16	15	15	15	12	12	11	10	10	10

APPENDIX IX

Trustees and Instructors from 1824 to 1914 Inclusive

* Indicates those *known* to be deceased.

Trustees

Patron

* Hon. Stephen Van Rensselaer.......................... 1824–39

Presidents

* Rev. Samuel Blatchford, D.D.......................... 1824–28
* Rev. John Chester, D.D.............................. 1828–29
* Rev. Eliphalet Nott, D.D., LL.D...................... 1829–45
* Rev. Nathan S. S. Beman, D.D., LL.D.................. 1845–65
* Hon. John F. Winslow................................. 1865–68
* Thomas C. Brinsmade, M.D............................. 1868–68
* Hon. James Forsyth, LL.D............................. 1868–86
Hon. John Hudson Peck, LL.D........................... 1888–01
Palmer C. Ricketts, E.D., LL.D........................ 1901–

Vice-Presidents

* Orville L. Holley, First Vice-President	1824–41
* T. Romeyn Beck, M.D., Second Vice-President	1824–29
* Hon. David Buel, Jr., Second Vice-President	1829–60
* Rev. Nathan S. S. Beman, D.D., LL.D	1841–45
* William P. Van Rensselaer	1845–65
* Thomas C. Brinsmade, M.D	1865–68
* Hon. George Gould	1868–68
* E. Thompson Gale, C.E	1868–72
* Hon. William Gurley, C.E	1872–87
* Albert E. Powers	1887–00
* William H. Doughty, C.E	1900–01
Elias P. Mann, C.E	1901–

Secretaries

* Moses Hale, M.D	1824–37
* Rev. Mark Tucker, D.D	1837–38
* Rev. Erastus Hopkins	1838–41
* Hon. Isaac McConihe, LL.D	1841–42
* Hon. Joseph White, LL.D	1842–49
* Stephen Wickes, M.D	1849–54
* Rev. John B. Tibbits, A.M	1854–61
* Hon. William Gurley, C.E	1861–71
* William H. Doughty, C.E	1871–97
John Squires, C.E	1897–

Treasurers

* Hon. Hanford N. Lockwood	1824–44
* Thomas C. Brinsmade, M.D	1844–47
* Hon. Day Otis Kellogg	1847–50
* William H. Young	1850–01
James H. Caldwell, B.S	1901–05
Paul Cook, A.M	1905–

Trustees

* Rev. Samuel Blatchford, D.D	1824–28
* Elias Parmelee, A.M	1824–34
* Hon. John Cramer	1824–49
* Hon. Guert Van Schoonhoven	1824–44
* Hon. Simeon De Witt	1824–28
* T. Romeyn Beck, M.D., LL.D	1824–28
* Hon. John D. Dickinson, LL.D	1824–40
* Jedediah Tracy	1824–25

Trustees (Continued)

* Hon. Richard P. Hart		1825–43
* Gen. Nicholas F. Beck, A.M		1828–31
* Judge Jesse Buel		1828–35
* Philip S. Van Rensselaer, A.M		1833–43
* Rev. Phineas L. Whipple		1833–37
* Hon. George Tibbits,	*ex officio* Mayor	1835–36
* William D. Haight,	" " Alderman	1835–36
* John P. Cushman,	" " Recorder	1835–38
* James Wallace,	" " Alderman	1836–38
* Hon. Jonas C. Heartt,	" " Mayor	1837–43
* Elias Dorlon,	" " Alderman	1838–39
* H. W. Strong,	" " Recorder	1838–44
* Henry Everts,	" " Alderman	1839–40
* Livy S. Stearns,	" " Alderman	1840–41
* Henry Everts,	" " Alderman	1841–42
* Rev. W. B. Sprague, D.D		1841–44
* John Holme		1841–56
* Rev. Alva T. Twing, D.D		1841–67
* Hon. David Buel, Jr		1842–44
* Rev. Eliphalet Nott, D.D., LL.D		1842–45
* Rev. Nathan S. S. Beman, D.D., LL.D		1842–65
* Hon. Isaac McConihe, LL.D		1842–67
* Daniel G. Egleston,	*ex officio* Alderman	1842–44
* Hon. Gurdon Corning,	" " Mayor	1843–47
* Abram B. Olin, LL.D.,	" " Recorder	1844–50
* Jared S. Weed,	" " Alderman	1844–45
* Rev. Reuben Smith		1844–47
* Thomas C. Brinsmade, M.D		1844–68
* William P. Van Rensselaer		1845–65
* Luther Tucker		1845–49
* Hon. Daniel D. Barnard, LL.D		1845–48
* Stephen Bowman,	*ex officio* Alderman	1845–47
* James Dana,	" " Alderman	1847–49
* Hon. Francis N. Mann, A.M.,	" " Mayor	1847–50
* Stephen Wickes, M.D		1847–54
* W. T. Seymour		1848–49
* Benjamin P. Johnson		1849–66
* Alexander Van Rensselaer, M.D		1849–67
* John Wilkinson		1849–55
* Hon. Joseph M. Warren, A.M		1849–96
* Le Grand B. Cannon		1849–64
* Hiram Slocum		1849–60
* Orsamus Eaton		1849–59

Trustees (*Continued*)

* Rev. John B. Tibbits, A.M	1849–67
* Leonard McChesney, *ex officio* Alderman	1849–50
* Amos Dean, LL.D	1849–53
* D. Thomas Vail, A.M	1850–82
* Hon. Joseph White, LL.D	1850–55
* Hon. Day Otis Kellogg, *ex officio* Mayor	1850–50
* Hon. Hanford N. Lockwood, " " Mayor	1850–51
* Hon. George Gould	1852–53
* Hon. Foster Bosworth	1853–53
* Hon. Elias Plum	1853–54
* Thomas W. Blatchford, M.D	1854–66
* Hon. Jonathan Edwards	1854–67
* Hon. John A. Griswold, *ex officio* Mayor	1855–56
* B. Franklin Greene, C.E., A.M	1855–59
* Hon. William Gurley, C.E	1855–87
* Hon. Jonathan E. Whipple	1856–66
* Hon. Hiram Slocum, *ex officio* Mayor	1856–57
* Hon. Alfred Wotkyns, M.D., *ex officio* Mayor	1857–58
* Hon. Arba Read, " " Mayor	1858–60
* Hon. John F. Winslow	1860–68
* E. Thompson Gale, C.E	1860–87
* Hon. John A. Griswold	1860–72
* Hon. Isaac McConihe, Jr., *ex officio* Mayor	1860–61
* Hon. George B. Warren, Jr., " " Mayor	1861–62
* William H. Young	1861–04
* Hon. Lyman Wilder	1861–85
* Hon. Arba Read	1861–63
* Albert E. Powers	1861–10
* Rev. Peter Bullions, D.D	1862–64
* Hon. James Thorn, M.D., *ex officio* Mayor	1862–63
* Hon. William L. Van Alstyne, " " Mayor	1863–64
* Hon. James Thorn, M.D., " " Mayor	1864–65
* Rev. Duncan Kennedy, D.D	1864–67
* Hon. Jonas C. Heartt	1864–74
* Hon. George Gould	1864–68
* David Cowee	1865–87
* Alexander L. Holley, LL.D	1865–66
* Hon. Uri Gilbert, *ex officio* Mayor	1865–66
* Frederick B. Leonard, M.D	1866–71
* James S. Knowlson, A.M	1866–08
* Hon. Uri Gilbert	1866–88
* Hon. David A. Wells, LL.D., D.C.L	1866–76
* Hon. John L. Flagg, *ex officio* Mayor	1866–68

Trustees (Continued)

* Hon. Charles R. Ingalls	1868–02
* Rev. Marvin R. Vincent, D.D	1867–69
* William A. Shepard	1867–83
* Hon. James Forsyth, LL.D	1867–86
* Joseph W. Fuller	1867–89
* Hon. William Kemp	1867–08
* Hon. Francis S. Thayer	1868–80
* Azro B. Morgan	1868–71
* Hon. Miles Beach, *ex officio* Mayor	1868–70
* Rev. J. Ireland Tucker, D.D	1868–95
* Alexander L. Holley, LL.D	1869–82
* Capt. Clarence E. Dutton, U. S. A	1869–76
* Henry C. Lockwood	1871–90
* William H. Doughty, C.E	1871–09
* Hon. Thomas B. Carroll, *ex officio* Mayor	1871–73
* Hon. Edward Murphy, Jr., " " "	1875–82
* Rev. William Irvin, D.D	1876–09
John D. Van Buren, Jr., C.E	1876–82
Charles Macdonald, C.E., LL.D	1880–
* James P. Wallace, C.E	1880–97
* Joseph C. Platt, Jr., C.E	1882–98
Elias P. Mann, C.E	1882–
* Hon. Edmund Fitzgerald, *ex officio* Mayor	1882–86
* Hon. Dennis J. Whelan, " " "	1886–94
Stephen W. Barker, C.E	1886–09
* Henry B. Dauchy	1886–03
* Henry G. Ludlow	1886–01
Robert W. Hunt	1886–
John H. Peck, LL.D	1887–01
Theodore Voorhees, C.E	1887–
Edward C. Gale, C.E	1887–
John Squires, C.E	1888–
Horace G. Young, C.E	1888–
Paul Cook, A.M	1890–
* Hon. Francis J. Molloy, *ex officio* Mayor	1894–00
* Hon. Russell Sage	1896–06
James H. Caldwell, B.S	1900–
* George B. Cluett	1900–05
* John I. Thompson	1900–01
Hon. Daniel E. Conway, *ex officio* Mayor	1901–03
Palmer C. Ricketts, E.D., LL.D	1901–
Alfred H. Renshaw, C.E	1901–
George B. Wellington, A.M., C.E., LL.B	1903–

Trustees (Continued)

Stewart Johnston, C.E.	1903–
* Edgar K. Betts	1903–08
Gen. J. Ford Kent	1903–
Hon. Joseph F. Hogan, *ex officio* Mayor	1904–05
Robert Cluett	1906–
Henry W. Hodge, C.E.	1906–
George S. Davison, C.E.	1909–
William F. Gurley, A.B.	1909–
* William Bayard Van Rensselaer, A.B.	1909–09
Henry S. Ludlow, A.B.	1909–
Frederick F. Peabody	1909–
William B. Cogswell, C.E.	1911–
Philip W. Henry, C.E.	1911–
Herbert S. Ide, A.B.	1911–
Hon. Cornelius F. Burns, *ex officio* Mayor	1912–

Executive Officers of the Faculty

Senior Professors

* Amos Eaton, A.M.	1824–42
* George H. Cook, C.E., B.N.S.	1842–46
* Charles Drowne, C.E., A.M.	1859–60

Directors

* B. Franklin Greene, C.E., A.M.	1847–59
* Rev. N. S. S. Beman, D.D., LL.D.	1859–60
* Charles Drowne, C.E., A.M.	1860–76
William L. Adams, C.E.	1876–78
* David M. Greene, C.E.	1878–91
Palmer C. Ricketts, C.E., E.D., LL.D.	1892–

Professors, Instructors, and Assistants

Astronomy

* Charles Drowne, C.E., A.M., Professor	1850–54
* Dascom Greene, C.E., " (Emeritus, 1893)	1858–93
Charles W. Crockett, C.E., A.M., LL.D.	1893 —
* Dascom Greene, C.E., Adjunct Professor	1856–58
Palmer C. Ricketts, C.E., Assistant Professor	1882–84
Charles W. Crockett, C.E., " "	1884–93
Palmer C. Ricketts, C.E., Assistant	1875–82

Botany

* Lewis C. Beck, M.D	Professor	1824–29
* John Wright, M.D.,	"	1836–46
* Frederick B. Leonard, M.D.,	"	1846–48
R. Halsted Ward, A.M., M.D.,	"	1869–92
William W. Rousseau, C.E.,	Assistant Professor	1912–
* Lewis G. Lowe, C.E., M.D.	Lecturer	1855–56
* José Tell Ferrao, B.S.,	Repeater	1850–51
R. Halsted Ward, A.M., M.D.,	Instructor	1868–69
Edward R. Cary, C.E.,	"	1892–04
William W. Rousseau, C.E.,	"	1904–12

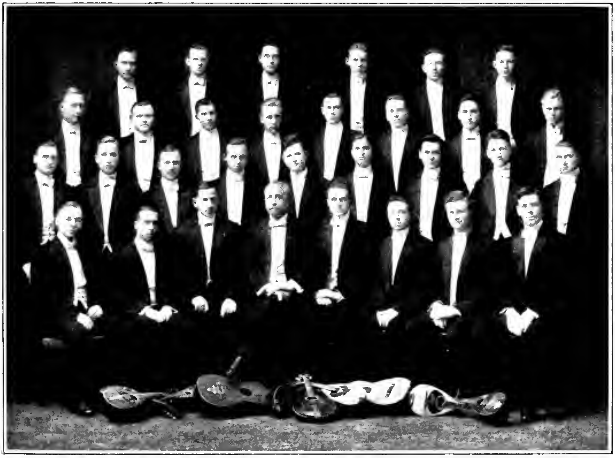
Chemistry

* Amos Eaton, A.M.,	Professor	1824–35
* James Hall, A.M., LL.D.,	"	1835–41
* George H. Cooke, C.E., B.N.S.,	"	1841–46
* William Elderhorst, M.D.,	"	1855–61
Charles A. Goessmann, Ph.D.,	"	1861–64
* Henry B. Nason, Ph.D., LL.D.,	"	1864–94
William P. Mason, C.E., M.D., LL.D.,	"	1886–
Azariah T. Lincoln, M.S., Ph.D.,	" (Organic)	1912–13
Azariah T. Lincoln, M.S., Ph.D.,	" (Physical)	1913–
* William C. Bailey, B.N.S.,	Assistant Professor	1839–39
William P. Mason, C.E., M.D.,	" "	1882–86
Azariah T. Lincoln, M.S., Ph.D.,	" "	1908–12
Frederick W. Schwartz, B.S., Ph.D.,	Assist. Prof. (Analytical)	1914–
Jonathan R. Powell, C.E.,	Repeater	1847–48
* Lewis G. Lowe, C.E.,	"	1849–50
* José Tell Ferrao, B.S.,	"	1850–51
* Dascom Greene, C.E.,	"	1852–53
* James T. Allen, B.S.,	"	1854–55
Elbert S. Platt, B.S.,	Instructor	1912–
Frederick W. Schwartz, B.S., Ph.D.,	"	1912–14
John M. Nelson, Ph.D.,	"	1907–08
Harold C. Chapin, M.A.,	"	1912–13
Russell S. Howard, B.S.,	"	1912–14
Matthieu Darmstadt, Ph.D.,	Assistant	1866–68
Irving A. Stearns, M.E.,	"	1868–69
* Edward Nichols, B.S.,	"	1871–73
Alfred S. Bertolet, M.E.,	"	1873–75
William P. Mason, C.E.,	"	1875–82
Elbert S. Platt, B.S.,	"	1899–02, 1911–12
James M. Caird,	"	1901–02
Edmund Fales,	"	1901–07

Athletic Committee of the Rensselaer Union

Student Council

Board of Editors of the Polytechnic



Glee Club

Frederick W. Schwartz, B.S.,	Assistant	1905–12
Ralph H. Sherry, A.M.,	"	1907–09
Johnson F. Hendry, B.S.,	"	1908–09
Harold C. Chapin, M.A.,	"	1909–12
Alfred E. Blake, B.S.,	"	1910–11
Russell S. Howard, B.S.,	"	1910–12
Ellis B. Cooper, Ch.B.,	"	1913–

Civil Engineering

* Amos Eaton, A.M.,	Professor	1828–42
* George H. Cook, C.E., B.N.S.,	"	1842–46
* Charles Drowne, C.E., A.M.,	"	1859–60
* William G. Lapham, C.E.,	Adjunct Professor	1838–39
* George H. Cook, C.E., B.N.S.,	" "	1840–41

Descriptive Geometry and Drawing

G. Gustavus Berger,	Professor	1850–51
* S. Edward Warren, C.E.,	"	1853–72
Dwinel F. Thompson, B.S.,	"	1873–
Edward F. Chillman, C.E.,	Associate Professor	1908–
Dwinel F. Thompson, B.S.,	Assistant "	1872–73
* Adolfo E. Besosa, C.E.,	" "	1880–82
Edward F. Chillman, C. E.,	" "	1902–08
David Hathaway,	Instructor	1847–50
* S. Edward Warren, C.E.,	"	1852–53
Charles H. Andros, C. E.,	"	1912–
Charles H. Andros, C.E.,	Assistant	1907–12
Albert H. Emery, C.E.,	"	1855–58
William H. Powless, C.E.,	"	1875–76
* Herman Voorhees, C.E.,	"	1877–78
John A. L. Waddell, C.E.,	"	1878–80
* Adolfo E. Besosa, C.E.,	"	1880–82
Edgar B. Kay, C.E.,	"	1883–85
Robert A. Cairns, C.E.,	"	1885–87
James N. Ewing, C.E.,	"	1887–88
Edward F. Chillman, C.E.,	"	1888–02
Harry J. Deutschbein, C.E.,	" (Drawing)	1905–07
Frank J. Blair, Jr., C.E.,	" "	1908–09

Electrochemistry

Matthew A. Hunter, M.A., D.Sc.,	Professor	1912–
Willis R. Whitney, Ph.D.,	Lecturer	1908–11

Electrochemistry and Physics

Matthew A. Hunter, M.A., D.Sc.,	Assistant Professor	1908–12

Electrical Engineering

E. D. N. Schulte, M.A., E.E.,	Associate Professor....	1909–
Wynant, J. Williams, C.E.,	Instructor............	1909–12
J. S. Hodges, A.B.,	Assistant.............	1901–02
E. D. N. Schulte, M.A., E.E.,	"	1902–04
Caryl D. Haskins, Ph.D.,	Lecturer..............	1908–11
Albert H. Armstrong, B.S.,	"	1908–
Walter D. Ryan	"	1912–

Electrical Engineering and Physics

Hugh McV. Anderson, C.E.,	Professor.............	1901–02
William L. Robb, Ph.D., LL.D.,	"	1902–
E. D. N. Schulte, M.A., E.E.,	Assistant Professor....	1906–09
E. D. N. Schulte, M.A., E.E.,	Instructor............	1904–06
John W. Bacon, E.E.,	"	1913–
Edward Y. Rice, E.E.,	"	1913–14
Edward J. K. Mason, A.M.,	Assistant.............	1904–06
Wynant J. Williams, C.E.,	"	1906–09
Harold S. Beers, C.E.,	"	1907–09
Edward C. Jones, E.E.,	"	1909–11
Allan DeW. Colvin, C.E.,	"	1909–11
John L. Weber, C.E.,	"	1910–12
John W. Bacon, E.E.,	"	1911–13
Edward Y. Rice, E.E.,	"	1911–13
Frank A. Rank, B.S.,	"	1911–13
John L. Gray, E.E.,	"	1912–
John A. Terrell, E.E.,	"	1913–
Philip C. Rummel, Jr., E.E.,	"	1914–

English Language

* James T. Allen, B.S.,	Professor.............	1855–58
* T. Newton Willson, A.M.,	"	1859–59
John G. Murdoch, M.A.,	"	1902–
Horace Loomis, C.E.,	Instructor............	1862–65
Charles E. Illsley, A.B., C.E.,	"	1866–67
* Alexander G. Johnson, A.M.,	"	1869–75
John H. Kellom, A.M.,	"	1876–77
William W. Morrill, A.M.,	"	1877–82
Frank L. Nason, A.B.,	"	1882–88
John G. Murdoch, A.M.,	"	1888–02
Albert S. Cox, A.M.,	"	1912–
* James R. Percy, C.E.,	Assistant.............	1857–59
Oakley A. Johnson, M.S.,	"	1907–09
Carl Wachter, A.B.,	"	1909–10
Nelson C. Hannay, B.A., B.D.,	"	1910–12

French Language

Louis Cousin, B.L.,	Professor	1856–59
* Philip H. Baermann,	"	1862–66
* J. H. C. L. de Marcelleau, A.B.,	"	1869–73
Arthur de Pierpont, B.A.,	"	1902–
Paul Edward Von Thun,	Instructor	1852–54
George F. Struvé,	"	1854–56
John B. Luce, A.M.,	"	1860–61
* J. H. C. L. de Marcelleau, A.B.,	"	1866–69
* Jules Godeby, A.B.,	"	1873–90
Benedict Papot,	"	1891–96
Arthur de Pierpont, B.A.,	"	1896–02
Amédée Simonin, Ph.D.,	"	1912–
Amédée Simonin, Ph.D.,	Assistant	1907–12

Geodesy †

* Charles Drowne, C.E., A.M.,	Professor	1851–55
* David M. Greene, C.E.,	"	1856–61
William H. Searles, C.E.,	"	1863–64
Charles McMillan, C.E.,	"	1865–71
William L. Adams, C.E.,	"	1872–78
* David M. Greene, C.E.,	"	1878–91
William G. Raymond, C.E.,	"	1892–05
Edward R. Cary, C.E.,	"	1904–
William H. Searles, C.E.,	Acting Professor	1862–63
William L. Adams, C.E.,	" "	1864–65
Charles E. Smith, C.E.,	" "	1871–72
* Thomas M. Cleeman, C.E.,	" "	1891–92
* William Fenton, C.E.,	Assistant Professor	1864–70
Edward R. Cary, C.E.,	" "	1902–04
William W. Rousseau, C.E.,	" "	1912–
* E. A. H. Allen, C.E.,	Repeater	1849–50
* George B. Roberts, C.E., B.N.S.,	"	1850–51
* William Tweeddale, C.E.,	Instructor	1852–54
* Joseph A. Moak, C.E.,	"	1854–55
* David M. Greene, C.E.,	"	1855–56
* Joseph G. Fox, C.E.,	"	1861–62
* William Fenton, C.E.,	"	1863–64
* C. Whitman Boynton, C.E.,	Assistant	1856–57
* Charles C. Martin, C.E.,	"	1856–57
William H. Powless, C.E.,	"	1875–76
* Herman Voorhees, C.E.,	"	1877–78

* Dcceased.

† For other assistants in this Department see "*Mathematics and Surveying.*"

Geodesy (Continued)

Robert R. Chadwick, C.E.,	Assistant	1878–82
George R. Baucus, C.E.,	"	1882–84
* John H. Emigh, C.E.,	"	1883–95
Harry L. Van Zile, C.E.,	"	1884–85
Charles W. Parks, C.E.,	"	1885–86
Augustus S. Kibbe, C.E.,	"	1886–87
* John J. Berger, C.E.,	"	1887–88
Guy B. Waite, C.E.,	"	1888–90
Edward R. Cary, C.E.,	"	1888–02
John Flynn, Jr., C.E.,	"	1902–03
Charles A. Roemer,	"	1902–09
William W. Rousseau, C.E.,	"	1904–12
Frank B. Gridley, C.E.,	"	1906–08
Dan W. Chamberlin, C.E.,	"	1907–08
Sherwood B. Grant, C.E.,	"	1908–09

Geology

* Amos Eaton, A.M.,	Professor	1824–42
* Ebenezer Emmons, A.M., M.D.,	"	1831–39
* George H. Cook, C.E., B.N.S.,	"	1842–46
* Edward A. H. Allen, C.E.,	"	1850–54
* James Hall, A.M., LL.D.,	" (Emeritus, 1876)	1854–76
* Robert P. Whitfield, A.M.,	"	1877–78
* Henry B. Nason, Ph.D. LL.D.,	"	1878–94
John M. Clarke, Ph.D., Sc.D., LL.D.,	" ..1896–99 and	1901–
Amadeus W. Grabau, S.M.,	"	1900–01
John M. Clarke, M.A.,	Instructor	1894–96
Amadeus W. Grabau, S.M.,	"	1899–00

German Language

* Philip H. Baermann,	Professor	1862–67
Paul Edward Von Thun,	Instructor	1850–54
George F. Struvé	"	1854–56

Hydraulic Engineering

Lewis F. Moody, B.S., M.S.,	Professor	1912–

Law

* James Forsyth, LL.D.,	Lecturer, Law of Contracts.	1875–86
John H. Peck, LL.D.,	" " " "	1888–01
G. B. Wellington, A.M., C.E., LL.B.,	" " " "	1901–
Albert G. Davis, B.S., M.L.,	Lecturer, Patent Law	1908–

* Deceased.

Mathematics †

* B. Franklin Greene, C.E., A.M.,	Professor...............	1847–50
* Charles Drowne, C.E., A.M.,	"	1850–55
* Dascom Greene, C.E.,	" (Emeritus, 1893).	1858–93
Chas. W. Crockett, C.E., A.M., LL.D.,	"	1893–
* Charles Drowne, C.E., A.M.,	Adjunct Professor.....	1849–50
* Dascom Greene, C.E.,	" "	1853–58
* T. Orlando Hopkins, C.E.,	Assistant Professor....	1857–59
* William Fenton, C.E.,	" "	1864–70
Arthur W. Bower, C.E.,	" "	1874–75
Palmer C. Ricketts, C.E.,	" "	1882–84
Charles W. Crockett, C.E., A.M.,	" "	1884–93
James McGiffert, C.E., M.A.,	" "	1902–
* Charles Drowne, C.E., A.M.,	Repeater..............	1847–48
* George W. Plympton, C.E.,	"	1850–50
* George B. Roberts, C.E., B.N.S.,	"	1850–51
* Dascom Greene, C.E.,	"	1852–53
* De Volson Wood, C.E.,	Instructor.............	1856–57
* Joseph G. Fox, C.E.,	"	1861–62
Horace Loomis, C.E.,	"	1862–64
* William Fenton, C.E.,	"	1863–64
* George M. Hunt, C.E.,	"	1864–67
Arthur W. Bower, C.E.,	"	1871–74
Palmer C. Ricketts, C.E.,	Assistant.............	1875–82
Frank L. Nason, A.B.,	"	1882–88
* John H. Emigh, C.E.,	"	1883–95
* James M. Wilson, C.E.,	"	1885–86
George W. Worcester, B.S.,	"	1887–88
Guy B. Waite, C.E.,	"	1888–90
John G. Murdoch, A.M.,	"	1888–02
Daniel L. Turner, C.E.,	"	1891–92
James McGiffert, Jr., C.E.,	"	1892–02
William E. Whitney, C.E.,	"	1896–97
William W. Rousseau, C.E.,	"	1899–04

Mathematics and Surveying

Elwyn M. Clarke, C.E.,	Assistant,	1904–12,	Instructor...	1912–
William R. Headden, C.E.,	"	1904–12,	" ...	1912–
Rudolph F. Tessier, C.E.,	"	1905–12,	" ...	1912–
Earle B. Fox, C.E.,	"	1907–12,	" ...	1912–
Chas. D. Babcock, C.E.,	"	1909–12,	" ...	1912–
Chas. D. Calkins, C.E.,	"	1909–12,	" ...	1912–

* Deceased.

† For other assistants in this Department see "*Mathematics and Surveying.*"

Mathematics and Surveying (Continued)

John H. Eglof, C.E.,	Assistant, 1909–12, Instructor...	1912–
Guy M. Phelps, C.E.,	" 1909–12, " ...	1912–
Louis B. Puffer, C.E.,	" 1909–12, " ...	1912–
Geo. H. Bainbridge, C.E.,	" 1910–12, " ...	1912–
Frank I. Williams, C.E.,	" 1910–12, " ...	1912–
George B. Banks, C.E.,	" 1912–14, " ...	1914–
Joseph Firth, C.E.,	Assistant.............	1901–02
Carl J. Schumann, C.E.,	"	1902–03
James R. Fitzpatrick, C.E.,	"	1903–05
James W. Morgan, C.E.,	"	1903–05
Charles A. Worden, C.E.,	"	1904–09
John W. Calder, C.E.,	"	1905–10
James M. Hemphill, C.E.,	"	1907–08
Orville L. Eltinge, C.E.,	"	1907–09
Donald N. Becker, C.E.,	"	1908–09
Herbert McM. Dibert, C.E.,	"	1908–09
Howard G. Millington, C.E.,	"	1908–10
Tandy A. Bryson, C.E.,	"	1910–11
Robert N. Greene, C.E.,	"	1911–12

Mechanics

* B. Franklin Greene, C.E., A.M.,	Professor.............	1850–59
* Charles Drowne, C.E., A.M.,	"	1860–76
William H. Burr, C.E.,	"	1876–84
Palmer C. Ricketts, E.D., LL.D.,	"	1884–
Thomas R. Lawson, C.E.,	"	1908–
Thomas R. Lawson, C.E.,	Associate Professor....	1906–08
* Charles Drowne, C.E., A.M.,	Adjunct Professor.....	1850–51
William H. Burr, C.E.,	Assistant Professor....	1876–76
* Adolfo E. Besosa, C.E.,	" "	1882–83
Thomas R. Lawson, C.E.,	" "	1902–06
Leroy W. Clark, C.E.,	" "	1914–
* E. A. H. Allen, C.E.,	Repeater.............	1850–50
* James W. Bradshaw, C.E.,	"	1850–51
* William Tweeddale, C.E.,	"	1852–54
George L. Moody,	"	1854–54
* C. Whitman Boynton, C.E.,	"	1856–57
* T. Orlando Hopkins, C.E.,	"	1857–59
Arthur W. Bower, C.E.,	Instructor	1871–75
Gordon S. Thompson, C.E.,	"	1912–
Leroy W. Clark, C.E.,	"	1912–14
William H. Burr, C.E.,	"	1875–76
William H. Powless, C.E.,	Assistant.............	1877–78

* Deceased.

Mechanics (Continued)

John A. L. Waddell, C.E.,	Assistant	1878–80
* Adolfo E. Besosa, C.E.,	"	1880–82
George R. Baucus, C.E.,	"	1883–83
Guy H. Elmore, C.E.,	"	1883–84
William W. Cummings, C.E.,	"	1884–89
Hugh Anderson, C.E.,	"	1889–98
Harry Shoemaker, C.E.,	"	1904–06
Gordon S. Thompson, C.E.,	"	1905–12
Leroy W. Clark, C.E.,	"	1906–12
John H. Spengler, C.E.,	"	1909–12
Henry E. Pulver, B.S., C.E.,	"	1912–13
William O. Andrews, B.S.,	"	1913–

Mechanical Engineering

Arthur M. Greene, Jr., B.S., M.E.,	Professor	1907–
Lewis F. Moody, B.S., M.S.,	Assistant Professor	1908–12
Robert L. Streeter, B.S., M.E.,	" "	1910–
Fred G. Hechler, M.E.,	Assistant, 1908–12, Instructor	1912–
Grant K. Palsgrove, M.E.,	" 1911–13, "	1913–
Henry J. Klotz, B.S.,	" 1912–14, "	1914–
William W. Edwards, B.S.,	Assistant	1907–12
Leo Loeb, A.B., B.S.,	"	1909–11
Milton C. Stuart, B.S.,	"	1909–12
Frank J. Willson, M.E.,	"	1911–13
Paul K. Mills, B.S.,	"	1912–13
Frank E. Bardrof, M.E.,	"	1913–
Frank L. Eidmann, M.E.,	"	1913–

Mental Philosophy

* N. S. S. Beman, D.D., LL.D.,	Professor	1854–65
* N. S. S. Beman, D.D., LL.D.,	Lecturer	1841–54

Metallurgy

George W. Maynard, A.M.,	Professor	1867–71
Enrique Touceda, C.E.,	"	1906–

Mineralogy

David H. Newland, A.B.,	Instructor	1912–
David H. Newland, A.B.,	Assistant	1907–12

Natural History

* Edward A. H. Allen, C.E.,	Professor	1854–55
* Henry B. Nason, Ph.D., LL.D.,	"	1858–64

* Deceased.

Pattern Making and Forging

Charles E. Stewart, B.S.,	Instructor............	1908–12
Alexander H. Cockburn,	"	1908–
George W. H. Fawkes,	"	1912–

Physical Training and Hygiene

Paul B. Samson, M.P.E.,	Professor.............	1912–
Francis E. Bernhard,	Assistant.............	1912–

Physics

* B. Franklin Greene, C.E., A.M.,	Professor.............	1847–53
Charles A. Goessmann, Ph.D.,	"	1861–64
Arthur W. Bower, C.E.,	"	1878–80
Frank P. Whitman, A.M.,	"	1880–86
W. Le Conte Stevens, Ph.D.,	"	1892–98
Hugh M. Anderson, C.E.,	"	1898–01
Charles W. Parks, C.E.,	Acting Professor......	1886–93
* Henry A. Rowland, C.E., Ph.D.,	Assistant Professor....	1874–75
Arthur W. Bower, C.E.,	" "	1875–78
Wynant J. Williams, C.E.,	" "	1912–
* Charles Drowne, C.E., A.M.,	Repeater.............	1847–50
* Lewis G. Lowe, C.E., B.N.S.,	"	1850–50
* James W. Bradshaw, C.E.,	"	1850–51
* William Tweeddale, C.E.,	"	1852–54
George L. Moody,	"	1854–55
Albert H. Gallatin, A.M., M.D.,	Lecturer..............	1866–67
* Henry A. Rowland, C.E., Ph.D.,	Instructor............	1872–74
J. S. Hodges, A.B.,	Assistant............	1900–01
Harold H. Rudd, B.A.,	"	1902–04

Railroad Signals

Pemberton Smith, C.E.,	Lecturer.............	1892–96
Peter G. Ten Eyck,	"	1906–06
William W. Lavarack,	"	1908–12
William H. Elliott,	"	1912–

Steam-engine

* David M. Greene, C.E.,	Professor.............	1878–91
H. de B. Parsons, B.S., M.E.,	"	1892–07
H. de B. Parsons, B.S., M.E.,	" (Emeritus) ...	1907–
William J. Keep, C.E.,	Lecturer.............	1877–78

* Deceased.

As shown in Chapter I, in the early days of the school, the teacher next in rank to the Senior Professor was called the Junior Professor, and the other instructors, who were appointed for a term or year, were called Assistants to the Senior Professor or to the Junior Professor.

Junior Professors

* Lewis C. Beck, M.D.	1824–29
* Hezekiah H. Eaton, A.B. (r.s.)	1829–30
* Paul E. Stevenson, A.B. (r. s.)	1830–31
* Ebenezer Emmons, A.M., M.D.	1831–39

Assistants to the Senior Professor

* Fay Edgerton, A.B. (r.s.)	1828
* Thomas C. Ripley, A.B. (r.s.)	1828
* Orlin Oatman, A.B. (r.s.)	1829
* Daniel O. Comstock, A.B. (r.s.)	1829
* James C. Booth	1831
* S. Wells Williams, A.B. (r.s.)	1832
* D. Cady Smith, A.B. (r.s.)	1833
* Alexander Van Rensselaer, A.B. (r.s.)	1833
* Theron R. Hopkins, A.B. (r.s.)	1834
* Edward Suffern, C.E.	1835
* Leman B. Garlinghouse, C.E.	1836
* George Johnson, C.E., B.N.S.	1836

Assistants to the Junior Professors

* Timothy Dwight Eaton, A.B. (r.s.)	1827
* Orlin Oatman, A.B. (r.s.)	1827
* John M. Barrows, A.B. (r.s.)	1829
* Hezekiah H. Eaton, A.B. (r.s.)	1829
* Douglas Houghton, A.B. (r.s.)	1830
* James B. Dungan	1830
* Abel Storrs, A.B. (r.s.)	1830
* Abram Sager, A.B. (r.s.)	1831
* James Hall, A.B. (r.s.)	1833

* Deceased.

APPENDIX X

Catalogue of Graduates with Degrees and Dates of Graduation

M.E. after the name of a graduate of one of the classes from 1868 to 1871 signifies "Mining Engineer"; the same letters after the name of a graduate of one of the classes 1911 to 1914 signifies "Mechanical Engineer." See page 105.

NAME.	DEGREE.	CLASS.
Abbe, Walter, Jr.	C.E.	1909
Abbott, Edward P.	C.E.	1913
Abbott, Walter R.	C.E.	1909
Abbott, William J.	C.E.	1909
Ackley, Calvin	C.E.	1854
Adam, Carl F.	C.E.	1890
Adams, Chester W.	C.E.	1903
Adams, David, Jr.	C.E.	1914
Adams, Edwin G., Jr.	C.E.	1891
Adams, William L.	C.E.	1862
*Addison, Alexander	C.E.	1866
Adey, Charles C.	C.E.	1911
Adey, William H.	C.E.	1895
Adolph, Joseph H., Jr.	C.E.	1909
Africa, James M.	C.E.	1888
*Aguiar, A. W. F. de	C.E.	1867
Aguilera, Eugene L.	C.E.	1887
Aguilera, Pedro T.	C.E.	1887
*Aguirregaviria, Castro	C.E.	1888
Aiken, William A.	C.E.	1872
Albarran, Eduardo M.	C.E.	1908
Alber, Chas. J.	C.E.	1907
Albright, John J.	M.E.	1868
*Alcover, Frederico M.	C.E.	1871
Alden, John F.	C.E.	1872
Alden, Langford T.	C.E.	1909
Aldrich, J. Franklin	C.E.	1877
Aldrich, Truman H.	M.E.	1869
Alexander, Alexander	C.E.	1912
*Allaire, William M.	C.E.	1876
*Allen, Edward A. H.	C.E.	1850
*Allen, James T.	B.S.	1855
Allen, John M.	C.E.	1908
Allen, Julian S.	C.E.	1885
Allen, Kenneth	C.E.	1879
*Ambler, John G.	A.B.(r.s.)	1833
Amsden, Ik. E.	C.E.	1891
Anderson, Hugh McV.	C.E.	1886
Anderson, James C.	C.E.	1876
Andrews, Ervin W.	C.E.	1909
Andros, Charles H.	C.E.	1907
Angell, Ralph L.	C.E.	1912
*Anthony, Charles H.	B.N.S.	1840
Anzola, Roberto	C.E.	1869
Applegate, Kenneth P.	E.E.	1912
*Appleton, Francis E.	C.E.	1863
Appleton, Thomas	C.E.	1868
*Arango, Ricardo M.	C.E.	1887
Ardila, Ricardo	M.E.	1912
Argollo, Miguel de T.	C.E.	1871
Argus, George L.	C.E.	1911
Armengol, Eladio	C.E.	1913
Armer, Hiley N.	C.E.	1909
Arms, Edward W.	C.E.	1869
*Arms, Stillman E.	A.B.(r.s.)	1826
*Arnold, Hiram	A.B.(r.s.)	1828
Arnold, Hubert T.	C.E.	1906
Arnold, John T.	C.E.	1885
Arnold, Lawrence L.	B.S.	1899
*Arnold, L.M.	B.N.S., C.E.	1837
Arnold, William H.	C.E.	1890
Arnold, Wendell M.	E.E.	1911
Arnsfield, James I.	M.E.	1913
Arosemena, Carlos C.	C.E., B.S.	1892

* Deceased.

NAME.	DEGREE.	CLASS.
Ashby, Edward B	C.E.	1886
Asseln, Emil	C.E.	1899
Auchincloss, W. S	C.E.	1862
*Auerbach, Charles G	C.E.	1877
Auringer, Jay A	C.E.	1906
Avakian, John C	C.E.	1902
*Avery, Henry J	B.N.S.	1838
Aycrigg, William A	C.E.	1884
Babcock, Charles D	C.E.	1909
Babcock, Franklin	C.E.	1907
Babcock, Henry N	M.E.	1870
Babcock, W. Irving	C.E.	1878
Babe, Jose M	C.E.	1902
Backes, Walter P	C.E.	1911
Bacon, John W	C.E.	1911
*Baermann, P. H	C.E.	1867
Bagg, Frederick A	C.E.	1893
*Bagley, John A	C.E.	1853
Bailey, Harrison A	M.E.	1913
*Bailey, Thomas W	C.E.	1849
*Bailey, William C	B.N.S.	1838
*Baily, Joseph T	C.E.	1870
*Bainbridge, Francis H	C.E.	1884
Bainbridge, G. H., Jr	C.E.	1910
Baker, Albert A	C.E.	1909
Baker, Arthur G	C.E.	1876
Baker, Arthur L	C.E.	1873
*Baker, Henry	C.E.	1837
Baker, John D	E.E.	1914
*Baker, William L	C.E.	1871
Balbin, Ernesto J	C.E.	1882
Baldwin, John H	C.E.	1909
*Baldwin, William L	C.E.	1861
Ball, Atilio C	E.E.	1911
*Ball, Jasper N	C.E.	1848
Ball, R. Edward	C.E.	1875
Baltimore, Garnet D	C.E.	1881
*Baltzell, Thomas K	C.E.	1854
Banker, Edward W	C.E.	1903
Banker, Walter B	C.E.	1911
Banks, George B	C.E.	1912
Bankson, Paul A	C.E.	1906

NAME.	DEGREE.	CLASS.
Bantel, E. C. H	C.E.	1897
Barber, Clarence M	C.E.	1878
Barcellos, J. J. A. de	B.S., C.E.	1868
Bardrof, Frank E	M.E.	1913
Barker, C. W. T	C.E.	1903
Barker, Stephen W	M.E.	1868
Barnard, James R	C.E.	1909
*Barnard, John F	C.E.	1850
Barnes, Frank E	C.E.	1898
Barnett, Charles R., Jr	C.E.	1903
Barney, Percy C	C.E.	1893
Barnum, David F	C.E.	1908
Barr, George G	M.E.	1914
Barros, Mario P. de	C.E.	1894
*Barrows, John M	A.B.(r.s.)	1829
Bartlett, Frank S	C.E.	1907
Bartley, Michael J	C.E.	1907
Bascom, Benj. H., Jr	C.E.	1903
Bascom, Harry F	C.E.	1896
Bates, Frank C	C.E.	1889
Bates, Robert G	C.E.	1911
Bates, William S	M.E.	1871
Baucus, George R	C.E.	1882
Baucus, William I	C.E.	1887
Baum, George	C.E.	1891
Bayley, C. A. D	C.E.	1900
*Bayley, G. W. R	C.E.	1838
Bayly, Lyster G	C.E.	1907
Bayly, Marcos E	C.E.	1898
Beall, Pendleton	C.E.	1909
Bean, Paul J	C.E.	1908
Beardsley, Arthur	C.E.	1867
Beardsley, Fred. A	C.E.	1911
Beardsley, Walter D	C.E.	1911
Beaty, Norman H	C.E.	1911
Becker, Donald N	C.E.	1908
Beebe, George H	C.E.	1896
Beebe, Henry R	C.E.	1904
Beer, Paul	C.E.	1900
Beers, Harold S	C.E.	1907
Beers, Robert A	C.E.	1908
Behan, William C	C.E.	1914

* Deceased.

NAME.	DEGREE.	CLASS.
Beiermeister, William	C.E.	1909
Belding, Sherman W	C.E.	1891
Bell, George A., Jr	C.E.	1900
Bell, James C	C.E.	1906
*Bell, James E	C.E.	1873
Bell, Stephen M	C.E.	1903
Belmont, Franklyn E	C.E.	1907
Bement, Robert B. C	C.E.	1869
*Bement, Rufus B	A.B. (r.s)	1830
*Benedict, Abner	A.B. (r.s.)	1826
Benkart, Harry W	C.E.	1906
Bennett, Fred C	C.E.	1912
Bentley, John C	C.E.	1904
Bergen, Van Brunt	C.E.	1863
Bergen, William J	C.E.	1897
*Berger, John J	C.E.	1886
Berndt, Edward C	C.E.	1914
Bertolet, Alfred S	M.E.	1871
*Besosa, Adolfo E	C.E.	1875
*Best, Arthur J	C.E.	1877
Beyer, A. G. H	E.E.	1914
Bidwell, George F., Jr	C.E.	1903
*Billings, C., Jr	C.E.	1877
Billingsley, Frederic N	C.E.	1910
Billingsley, Jas. W	C.E.	1902
Binsse, Henry B	C.E.	1875
Birch, Charles E	C.E.	1892
*Birdsall, James W	T.E.	1860
Bixby, William F	C.E.	1906
Black, Alexander M	C.E.	1869
Black, Edward F	C.E.	1904
Black, Joel H	C.E.	1911
Blackhall, Walter L	B.S.	1907
Blair, Frank J	C.E.	1907
Blair, Frank K	E.E.	1911
*Blaisdell, Anthony H	C.E.	1870
Blake, James J	C.E.	1894
Blandy, Isaac C	C.E.	1887
*Blanton, L. Harvie	C.E.	1877
Blaum, William J	C.E.	1912
Blitman, Charles H	C.E.	1914
*Bloss, Jabez P	B.N.S.	1846
Bloss, Richard P	C.E.	1881
*Blun, Abram	C.E.	1873
Boardman, Arthur E	C.E.	1870
*Boardman, Henry M	C.E.	1871
Bode, Francis X	C.E.	1911
Bogue, Virgil G	C.E.	1868
Bolano, Emanuel L	C.E.	1909
Bold, Ralph E	C.E.	1910
*Boller, Alfred P	C.E.	1861
*Boller, Frederick J	C.E.	1869
*Bontecou, Reed B	B.N.S.	1842
Booth, Harvey	C.E.	1912
*Booth, James C	† PH.D.	1831
Booth, James N	C.E.	1912
Bornefeld, Charles F	C.E.	1909
*Bostrom, Augustus O	C.E.	1877
Bostrom, Carl A	C.E.	1901
Bosworth, A. P	C.E.	1899
Botero, Fabriciano	C.E.	1885
*Bours, Benjamin W	C.E.	1839
*Bowen, Franklin H	C.E.	1883
Bower, Arthur W	C.E.	1871
Boyd, James K	C.E.	1895
Boyd, William C	C.E.	1895
*Boyd, William H	A.B. (r.s.)	1832
Boyle, Leo T	C.E.	1901
*Boynton, C. Whitman	C.E.	1856
Bradbury, Orlando E	C.E.	1907
Bradley, C. A	C.E.	1897
Bradley, Theo. J	B.S.	1904
*Bradshaw, James W	C.E.	1850
*Bradway, J. R	C.E., B.N.S.	1841
Brahe, Karl A	C.E.	1914
Brainard, Hervey E	C.E.	1901
*Brainard, George B	C.E.	1865
Branan, Glen W	C.E.	1914
Braunschweiger, Albert	C.E.	1906
Breed, Allen	C.E.	1910
Breese, James L	C.E.	1875
Breithaupt, W. H	C.E.	1881
Brelsford, John H	C.E.	1914
Brenn, C. F	C.E.	1897

* Deceased. † Honorary Degree Conferred in 1884.

NAME.	DEGREE.	CLASS.
Bretz, Charles E.	C.E.	1912
*Bridgers, R. R.	C.E.	1879
*Briggs, Caleb	B.N.S., C.E.	1835
Briggs, Josiah A., Jr.	C.E.	1903
*Briggs, Roswell E.	C.E.	1868
*Brinley, E., Jr.	B.N.S., C.E.	1839
Brinsmade, H. N.	C.E.	1879
Britton, George C.	C.E.	1907
*Brodt, John H.	C.E., B.N.S.	1844
Brohm, William C.	C.E.	1895
Brokaw, Herbert S.	C.E.	1908
Brown, Carleton F.	C.E.	1904
Brown, Harry B.	C.E.	1911
Brown, Herman M.	C.E.	1914
Brown, Marshall W.	C.E.	1894
Brown, N. W. L.	C.E.	1892
Brown, Robert K.	C.E.	1888
Brown, Thurber A.	C.E.	1883
Brown, William S.	E.E.	1913
*Browne, Percy T.	C.E.	1863
Bruckmann, G. T.	B.S.	1890
Bruns, Henry F.	C.E.	1914
Brust, Robert S.	C.E.	1910
Bryan, George, Jr.	C.E.	1908
*Bryant, Cyrus	A.B.(r.s.)	1829
*Bryant, Fred M.	C.E.	1873
Brydone-Jack, E. E.	C.E.	1894
Bryson, Tandy A.	C.E.	1910
*Buck, B. Franklin	C.E.	1837
*Buck, Leffert L.	C.E.	1868
Buck, Richard S.	C.E.	1887
*Buckhout, N. W.	C.E.	1862
*Buckingham, E. P.	C.E.	1861
Buckley, Timothy J.	C.E.	1909
*Bucknell, Elmer J.	C.E.	1892
Buel, Albert W.	C.E.	1883
*Buel, Richard H.	C.E.	1862
*Buel, Samuel, Jr.	C.E.	1865
Bull, George M.	C.E.	1897
*Bullard, Gardner	A.B.(r.s.)	1828
*Burden, Henry	M.E.	1869
Burden, James	C.E.	1892
Burden, Morton	C.E.	1895
*Burdett, Edward A.	C.E.	1876
Burgar, Fred A.	C.E.	1913
Burge, Alfred W.	C.E.	1893
*Burgess, William N.	M.E.	1869
Burgoyne, John H., Jr.	C.E.	1902
*Burhans, Frederick O.	B.S.	1853
Burke, James J.	C.E.	1904
Burlingham, Prentice H.	C.E.	1902
*Burnet, Leicester	C.E.	1856
Burnham, George, Jr.	C.E.	1872
Burr, William H.	C.E.	1872
*Burrall, William H.	C.E.	1851
Burroughs, Frederick	C.E.	1903
Burrows, Lynn M.	C.E.	1907
Burton, William	C.E.	1902
Bush, Arthur L.	C.E.	1911
Bush, Frank A.	C.E.	1913
Bushnell, Joseph, Jr.	C.E.	1877
*Buswell, E. G.	B.N.S., C.E.	1841
Butler, Lawrence P.	C.E.	1890
Butt, McCoskry	C.E.	1882
Butterfield, Thomas E.	C.E.	1897
*Buxton, Clifford	C.E.	1865
*Byram, William H.	C.E.	1877
Cabot, William B.	C.E.	1881
Caceres, Simon N.	C.E.	1898
Cairns, Robert A.	C.E.	1885
Calder, John W.	C.E.	1905
Calkins, Charles D.	C.E.	1909
Caldwell, Charles A.	C.E.	1888
Caldwell, James H.	B.S.	1886
Caldwell, James N.	C.E.	1874
Caler, Willard L.	C.E.	1906
*Callery, William V.	C.E.	1886
Campbell, Charles	C.E.	1873
Campbell, Charles W. Jr.	C.E.	1879
*Campbell, James, Jr.	B.N.S.	1843
Campbell, J. Herbert	C.E.	1900
Campbell, Joseph H.	M.E.	1868
Campbell, Lawrence V.	C.E.	1910
Caney, George F.	E.E.	1912

* Deceased.

NAME.	DEGREE.	CLASS.
Caney, Wilbur H.	C.E.	1912
*Cantanhede, P. de C.	C.E.	1881
Carbonell, Carlos F.	C.E.	1875
Card, William D.	C.E.	1890
Carhart, Augustus L.	C.E.	1900
Carnrick, George W.	C.E.	1874
Carollo, Bert J.	C.E.	1913
*Carr, Ezra S.	C.E., B.N.S.	1838
Carreno, Alejo A.	C.E.	1903
Carrington, R. H.	C.E.	1912
Carroll, Charles S.	C.E.	1912
Carter, Edward C.	C.E.	1876
Carter, Edward F.	C.E.	1907
Carter, Paul E.	C.E.	1908
Cary, Edward R.	C.E.	1888
Casanova, Jose N.	B.S.	1859
Case, Ralph E.	E.E.	1912
Casellas, Ramon R.	C.E.	1905
Caso, Fernando	C.E.	1914
*Cassatt, Alexander J.	C.E.	1859
Castro, Alberto de	T.E.	1860
Cather, Don R.	C.E.	1914
Catuna, G. V. de B.	C.E.	1913
Cavalcanti, Antonio B.	C.E.	1913
*Ceballos, G. F. de	C.E.	1868
Chadwick, Robert R.	C.E.	1878
Chalfant, Herman S.	C.E.	1907
*Chamberlaine, N. H.	C.E.	1856
Chamberlin, Dan W.	C.E.	1907
Chambers, Frank T.	C.E.	1892
Chambers, John	C.E.	1886
*Chambers, John S., Jr.	C.E.	1881
Chambers, Ralph H.	C.E.	1893
*Chandler, Jonathan	A.B.(r.s.)	1827
Chapman, James L., Jr.	C.E.	1901
Chesrown, Elias	C.E.	1885
Chibas, Eduardo J.	C.E.	1889
Child, Harry C.	C.E.	1907
Childs, Richard T.	C.E.	1903
Chillman, Edward F.	C.E.	1888
*Chislett, John J.	C.E.	1884
Christie, David E.	C.E.	1913
Christie, Harold B.	C.E.	1914
*Chrysler, Frank	C.E.	1884
*Chubb, A. Lamont	C.E., B.N.S.	1848
*Church, Daniel W.	C.E.	1877
Church, Frederick B.	C.E.	1891
Church, Gaylord	C.E.	1913
Church, Townsend V.	C.E.	1881
Church, William L.	C.E.	1872
Church, Walter S.	C.E.	1912
Cintra, Francisco deA.	C.E.	1881
Clark, Arthur T.	C.E.	1907
Clark, Clarence L.	C.E.	1911
*Clark, Dorlon	C.E.	1885
Clark, Elwyn M.	C.E.	1904
Clark, Frank L.	C.E.	1880
Clark, John A.	C.E.	1887
Clark, John M.	C.E.	1856
*Clark, Joseph E.	B.N.S.	1845
Clark, LeRoy W.	C.E.	1906
Clark, Sidney H.	C.E.	1914
*Clarke, Joseph B.	A.B.(r.s.)	1829
*Cleemann, Thomas M.	C.E.	1865
Clemens, Hays H.	C.E.	1907
*Clement, William H.	C.E.	1835
Cleveland, Ernest W.	C.E.	1914
Clifton, William A.	C.E.	1908
*Clinch, J. Morton	C.E.	1854
Clohessy, Edmund J.	C.E.	1910
Cluett, Sanford L.	C.E.	1898
Cobb, Arthur	C.E.	1880
*Cobb, James C.	A.B.(r.s.)	1831
Cogswell, William B.	†C.E.	1851
Cohn, August M. F.	C.E.	1911
*Coit, James C.	C.E.	1858
Colby, Archie L.	C.E.	1887
Colby, John D.	C.E.	1884
Colby, Safford K.	C.E.	1894
Collamer, Ernest D.	C.E.	1912
*Collin, David	C.E., B.N.S.	1842
*Collingwood, Francis	C.E.	1855
*Collins, Charles	C.E., B.N.S.	1840
Colvin, Allan D.	C.E.	1906

* Deceased. † Honorary degree conferred in 1884.

NAME.	DEGREE.	CLASS.
Colyer, Charles I	C.E.	1899
*Comstock, Daniel O	A.B.(r.s.)	1829
Conklin, Silas H	E.E.	1914
Connell, Joseph A	C.E.	1914
Connery, Casper M	C.E.	1911
Connett, Albert N	C.E.	1880
Connett, Albert N., Jr	C.E.	1907
Converse, Joseph B	C.E.	1910
Converse, Wade	C.E.	1880
Conway, John W	M.E.	1912
*Cook, Albert B	C.E.	1892
*Cook, Charles R	C.E.	1837
*Cook, George H	C.E., B.N.S.	1839
Cook, James M	C.E.	1898
*Cook, Robert G	B.N.S.	1847
Cooley, Lyman E	C.E.	1874
Cooper, Theodore	C.E.	1858
Coover, Mervin S	E.E.	1914
Copeland, David B	C.E.	1912
Corning, Dudley T	C.E.	1898
Cornwell, William D	C.E.	1901
Coroalles, Manuel A	C.E.	1897
Corry, Walter W	C.E.	1914
*Cotes, Elihu W	C.E.	1839
*Cotterell, Nathan	C.E.	1841
*Cottman, Joseph B	B.N.S.	1835
Cottrell, Norman E	C.E.	1907
Coulson, Benjamin L	C.E.	1893
*Coupland, Harold J	C.E.	1896
Courtenay, William H	C.E.	1879
*Cova, Nicholas de la	C.E.	1904
*Covode, James H	C.E.	1882
*Cox, A. Beekman	C.E.	1867
Cox, Harold M	C.E.	1912
Cox, Leonard M	C.E.	1892
Coy, Burgis G	C.E.	1904
Coyle, David C	C.E.	1910
*Craft, Charles C	C.E.	1866
*Crafts, Walter	C.E.	1859
Craig, Earle C	C.E.	1910
Craig, Walter J	C.E.	1910
Craig, Washington R	C.E.	1893

NAME.	DEGREE.	CLASS.
Cramer, Eliphalet W	C.E.	1879
Crandall, William G	C.E.	1912
Crandell, Edwin D	E.E.	1914
Crary, Alexander P	C.E.	1901
Creager, William P	C.E.	1901
*Crehore, C. Frederic	C.E.	1848
Creighton, Harry M	C.E.	1912
*Crocker, Edwin B	A.B. (r.s.)	1833
Crockett, Charles H	C.E.	1912
Crockett, Charles W	C.E.	1884
*Cromwell, James	C.E.	1861
Crosby, Homer	C.E.	1887
Crosby, Horace	C.E.	1862
*Cross, Charles E	C.E.	1855
*Cross, Charles S	C.E.	1838
Crowley, Charles F	C.E.	1906
Crowley, Frederick C	C.E.	1912
Culver, Francis E	C.E.	1912
*Cummings, C. A	B.N.S., C.E.	1849
Cummings, Fred M	C.E.	1886
Cummings, W. W	C.E.	1884
Cunningham, A. C	C.E.	1885
Cunningham, Seymour	C.E.	1884
Cunningham, William F	C.E.	1904
Cuntz, Johannes H	C.E.	1886
*Curfman, Samuel B	C.E.	1894
Curly, John S	E.E.	1914
Curtis, Harold E	C.E.	1909
*Curtis, Henry	C.E.	1854
*Curtis, John H	C.E.	1873
Cushman, George H	C.E.	1879
Cutler, Simon O	C.E.	1911
*Dabney, Frederick Y	C.E.	1857
Dalstrom, Oscar F	C.E.	1901
Dalton, Ernest W	C.E.	1912
*Danforth, Henry W	C.E.	1842
*Danker, Albert	A.B.(r.s.)	1826
*Dauchy, Edward N	C.E.	1840
Dauchy, Walter E	C.E.	1875
Davenport, Ezekiel C	C.E.	1886
*Davenport, Fred	C.E.	1892
Davenport, Henry B	C.E.	1886

* Deceased.

NAME.	DEGREE.	CLASS.
*Davey, John J	A.B.(r.s.)	1827
Davies, Clarence E	M.E.	1914
Davis, Charles H	C.E.	1884
Davis, Chester B	C.E.	1877
Davis, Frank R	C.E.	1913
Davis, James W	C.E.	1901
Davis, Joseph P	C.E.	1856
Davis, Josiah R. T	C.E.	1876
Davis, Ralph E	C.E.	1910
Davis, Reuben	C.E.	1903
Davis, Samuel T., Jr	C.E.	1895
Davison, Allen S	C.E.	1909
Davison, George S	C.E.	1878
Daye, John N	C.E.	1913
Deal, Alvin E	C.E.	1882
Deal, Elvin A	C.E.	1882
Decker, Henry H	C.E.	1897
*Decker, Theo. W	A.B.(r.s.)	1830
Degnon, Norman G	C.E.	1911
De Leon, Moise	C.E.	1892
DeLong, James A	C.E.	1901
Demming, Raymond E	C.E.	1909
Denegre, William P	C.E.	1877
*Dennis, George R	B.N.S.	1839
Denny, Stacey E	C.E.	1891
DeRhodes, Guy L	C.E.	1913
DeRonde, Louis A	C.E.	1910
Deutschbein, Harry J	C.E.	1903
*Devol, Edward	A.B.(r.s.)	1831
DeWitt, Rumley	C.E.	1908
*Dias, Luiz da R	† T.E., C.E.	1860
Dibert, Herbert M	C.E.	1908
Dickinson, E. M., Jr	C.E.	1913
Diehl, George C	C.E.	1894
Diekmeier, George W	C.E.	1895
Dike, Albyn P	C.E.	1877
Dike, James P	C.E.	1912
Dingelman, Carl	C.E.	1913
Dion, Edward H	C.E.	1912
Diratzouyan, Janik K	C.E.	1910
Disbrow, W. H. B	C.E.	1896
Diven, John M	C.E.	1913
*Dodge, Richard D	C.E.	1860
Dodge, Richard V	M.E.	1912
*Doolittle, Allison B	C.E.	1906
Doran, Maurice P	C.E.	1912
Dore, John E	C.E.	1913
Dorrance, Frank Y	C.E.	1906
Dorsey, Leander	C.E.	1899
Doty, Frederick W	C.E.	1907
Doty, John W	C.E.	1902
*Doughty, W. H	C.E.	1858
Drake, Tracy C	B.S.	1886
*Drayton, Henry J	C.E.	1839
*Drayton, James S	B.N.S.	1836
Dresser, Elbert H	C.E.	1905
*Drew, Francis G	A.B.(r.s.)	1827
Drexler, Norman E	C.E.	1912
*Drowne, Charles	C.E., B.N.S.	1847
*Duane, Harry B	C.E.	1878
*Duane, James	C.E.	1873
Dubs, Alford W	C.E.	1908
Dugan, James H	C.E.	1907
Du Mont, H. V. G	C.E.	1912
DuMoulin, Walter L	C.E.	1908
Duncan, Greer A	C.E.	1912
*Durbin, James G	C.E.	1884
*Durham, Anson	C.E.	1840
Dwyer, Harold R	C.E.	1913
Dyer, James A	C.E.	1897
Earle, Thomas	C.E.	1887
Easby, M. Ward	C.E.	1886
Easby, Paul H	C.E.	1886
Easby, William, Jr	C.E.	1890
Easton, Russell B	C.E.	1907
Eaton, Harold C	C.E.	1914
*Eaton, Hezekiah H	A.B.(r.s.)	1826
*Eaton, Timothy D	A.B.(r.s.)	1826
Echeverria, Juan F	C.E.	1885
Eckert, Edward W	C.E.	1875
Eddy, Howard R	E.E.	1912
*Eddy, Jacob F	C.E.	1835
*Edgerton, Fay	A.B.(r.s.)	1828
Edgerton, Ralph W	C.E.	1898

* Deceased. † Honorary degree C.E., conferred in 1882.

Band

Orchestra

Football Team

Track Team

NAME.	DEGREE.	CLASS.
Edwards, Frederick	C.E.	1895
*Edwards, John C	C.E.	1885
Edwards, Oliver C., Jr.	C.E.	1907
*Edwards, Richard	B.N.S., C.E.	1848
Edwards, Thomas H	C.E.	1891
Eglof, John H	C.E.	1909
Eguiguren, V. F	C.E.	1888
Eichleay, Roy O	C.E.	1913
Elder, George R	C.E.	1884
*Eldridge, Archibald R	C.E.	1888
*Eldridge, Griffith M	C.E.	1885
Elliot, Henry S	C.E.	1900
Elliott, Nathaniel R	C.E.	1911
Ellis, George E	C.E.	1892
*Ellis, George F	C.E.	1856
Elmer, Howard N	C.E.	1877
Elmore, Guy H	C.E.	1883
Elster, Gurdon G	C.E.	1907
Elster, John B	C.E.	1906
Eltinge, Orville L	C.E.	1906
Ely, Theodore N	C.E.	1866
*Emerson, Rufus H	C.E.	1861
Emery, Albert H	C.E.	1858
Emig, Jacob W	C.E.	1903
Emig, John W	C.E.	1898
*Emigh, John H	C.E.	1879
Emigh, William C	C.E.	1909
Emmerich, Edward E	C.E.	1892
*Emmons, Ebenezer	A.B.(r.s.)	1826
Emory, Gustavus W	C.E.	1887
*Emory, Thomas	A.B.(r.s.)	1828
Endicott, Mordecai T	C.E.	1868
Endress, William F	C.E.	1879
Ensign, Milton W	C.E.	1871
Eppele, Frank J	C.E.	1888
Escarza, Sotera E	C.E.	1894
*Escobar, Jose	C.E.	1867
Escobar, Robert	C.E.	1857
Estabrook, John D	C.E.	1856
Estep, Josiah M	C.E.	1889
Eva, Samuel J	C.E.	1891
Evans, James R	B.S.	1905

NAME.	DEGREE.	CLASS.
*Evans, Myron E	C.E.	1895
*Evans, W. W	C.E.	1836
*Ewens, John	C.E.	1878
Ewing, J. Nelson	C.E.	1887
Ewing, Wm. M	C.E.	1902
Fabian, William J	C.E.	1874
Fairbanks, Harry J	C.E.	1911
Fairchild, Henry M	C.E.	1886
Fales, W. L	C.E.	1897
Fallon, Henry D	C.E.	1912
Farnum, Henry H	C.E.	1865
Farrell, John J., Jr.	C.E.	1913
Farrell, Thomas F	C.E.	1912
*Farwell, Elmer S	C.E.	1891
*Fay, Francis F	M.E.	1868
Feldmeier, Harvey	C.E.	1892
Felton, Herbert C	C.E.	1866
Fenton, George Y	C.E.	1912
Fenton, Louis G	C.E.	1903
*Fenton, William	C.E.	1861
Ferebee, Alan M	C.E.	1904
*Ferrao, Jose Tell	B.S.	1850
*Ferris, George W. G	C.E.	1881
*Ferris, John A., Jr.	C.E.	1875
Fickes, Edwin S	C.E.	1894
*Field, Charles S	C.E.	1838
Fields, Samuel J	C.E.	1867
Filer, Walter G	C.E.	1890
Finch, Cecil C	M.E.	1914
Finch, Royal G	C.E.	1906
*Firth, Frederick W	C.E.	1902
Firth, Joseph	C.E.	1901
*Fish, Dean	B.S.	1886
Fisher, Albert L	E.E.	1912
*Fisher, Charles H	† C.E.	1853
*Fisher, Clark	C.E.	1858
*Fisher, Joseph S	C.E.	1849
Fisher, Lewis G	C.E.	1904
*Fisher, Tucker H	C.E.	1875
*Fitch, Asa, Jr.	A.B.(r.s.)	1827
Fitzpatrick, James R	C.E.	1903
Flanagan, Edward J	C.E.	1913

* Deceased. † Honorary degree conferred in 1882.

NAME.	DEGREE.	CLASS.	NAME.	DEGREE.	CLASS.
Fleeger, Burtner	C.E.	1910	Fuess, Frederick F	C.E.	1894
Flynn, John, Jr	C.E.	1894	*Furber, Robert S	C.E.	1909
Flynn, William	C.E.	1910	Gabriels, Henry E	C.E.	1910
Fogarty, Joseph A	C.E.	1908	Gale, E. Courtland	C.E.	1883
*Folin, Ormond W	B.S.	1859	*Gale, E. Thompson	C.E.	1837
Fonda, William V. T	C.E.	1913	*Gale, George A	B.N.S.	1847
Foote, Olney N	C.E.	1909	Gallagher, Lawrence	C.E.	1913
Ford, Edwin	C.E.	1882	Gallico, George G	C.E.	1910
*Ford, Frank L	C.E.	1874	Gallogly, Harry P	C.E.	1913
*Ford, John Q. A	C.E.	1866	Ganson, James T	C.E.	1911
Forster, Linn H	M.E.	1913	*Garcia, F. Garcia y	C.E.	1872
Forsyth, Robert	C.E.	1869	Gardenièr, Howard T	C.E.	1907
*Fortun y Andre, S	C.E.	1889	*Gardner, Arthur B	C.E.	1891
*Foster, Albert W	C.E.	1871	Gardner, Marvin B	C.E.	1908
Foster, S. I	C.E.	1902	Garland, William S	C.E.	1894
Foster, Thomas J	C.E.	1892	Garlinghouse, Fred L	C.E.	1871
*Fowler, Albert C	C.E.	1878	*Garlinghouse, L. B	C.E.	1837
Fowler, Clarence A	C.E.	1885	Garlinghouse, Leslie H	C.E.	1910
Fowler, John C., Jr	C.E.	1914	Garlinghouse, Ralph L	C.E.	1912
Fowler, Otis L	M.E.	1914	Garvin, Burr K	C.E.	1912
*Fox, Albert R	A.B.(r.s.)	1830	Garzon, Julio N	C.E.	1894
Fox, Charles L	C.E.	1902	Gasteazoro, Carlos A	C.E.	1891
Fox, Earle B	C.E.	1907	*Gearn, Walter A	C.E.	1878
*Fox, Joseph G	C.E.	1861	Gebhard, Peter T	E.E.	1913
*Fox, Peter H	C.E.	1864	Geer, Harvey M	C.E.	1872
Fox, Raymond F	M.E.	1913	Geiger, William F	C.E.	1909
Fox, S. Waters	C.E.	1876	Gest, Alexander P	C.E.	1874
Fox, William A	C.E.	1906	Getchell, William S	C.E.	1898
*Fox, William L	C.E.	1875	*Geuder, Gottlieb	C.E.	1876
Franco, Antonio de B	C.E.	1890	Gibbs, L. A	C.E. 1892, B.S.	1893
Franco, Eugenio de L	C.E.	1878	Gibeau, Henry A	C.E.	1908
Frank, Isaac W	C.E.	1876	Giberga, Ovidio	C.E.	1885
Frazier, James W	C.E.	1894	*Giblin, Arthur L	C.E.	1891
*Freeman, Ernest G	C.E.	1888	Gibson, Carleton B., Jr	C.E.	1914
Freeman, Harold A	C.E.	1876	Giesey, Jesse K	C.E.	1904
Freeman, Henry R., Jr	C.E.	1914	Gifford, George E	C.E.	1887
Fritcher, George E	C.E.	1878	Gifford, George H	C.E.	1906
*Frith, Arthur J	C.E.	1873	Gifford, Leslie P	C.E.	1909
Frost, Edward M	C.E.	1911	Gifford, Lester R	C.E.	1895
Frost, Stuart E	C.E.	1909	Giles, Henry H	C.E.	1911
*Frothingham, J. H.	B.N.S., C.E.	1849	Give, Henry L. de	C.E.	1888
*Fuertes, Estevan A	C.E.	1861	Gleason, Robert I	C.E.	1896

* Deceased.

NAME.	DEGREE.	CLASS.
Glominski, John A.	C.E.	1908
Glueck, Frank J.	C.E.	1912
Godard, Valentine.	C.E.	1914
Goetzman, F. G.	C.E.	1878
Goicouria, A. V. de.	C.E.	1871
*Gold, Miner.	A.B.(r.s.)	1829
Golden, Edward W.	C.E.	1912
*Goldstein, Max L.	C.E.	1867
Gonzalez, Juan, Jr.	C.E.	1870
Gordon, Samuel.	C.E.	1908
Gormly, Walter B.	C.E.	1895
Gottlieb, Richard D.	C.E.	1890
Gould, Harry M.	C.E.	1895
*Gould, James P.	C.E.	1863
Gove, Ralph A., Jr.	C.E.	1909
*Gowing, Burdett C.	C.E.	1861
Grace, John W.	C.E.	1895
Graham, Frank N.	C.E.	1898
Graham, Germain P.	C.E.	1908
Graham, Joseph W.	C.E.	1910
Granados, R. G. Jr.,	C.E.	1908
Granger, Arthur J.	C.E.	1912
Grant, Bertrand E.	C.E.	1890
*Grant, Edward M.	C.E.	1860
Grant, Sherwood B.	C.E.	1908
Grathwol, Henry J.	C.E.	1914
Grattan, Thomas F.	C.E.	1903
Graue, Fred, Jr.	C.E.	1912
Gray, George L.	E.E.	1912
Gray, John H.	C.E.	1887
Greeley, Samuel S.	C.E.	1846
Greene, Egbert T.	C.E.	1912
Green, Lansdale B.	C.E.	1891
Greenalch, Wallace.	C.E.	1893
Greenaway, Edward A.	E.E.	1912
*Greene, Albert S.	C.E.	1859
*Greene, B. Franklin,	C.E., B.N.S.	1842
*Greene, Dascom.	C.E.	1853
*Greene, David M.	C.E.	1851
*Greene, George M.	C.E.	1859
Greene, Joseph S.	C.E.	1878
Greene, Robert C.	C.E.	1905
Greene, Robert N.	C.E.	1911
Greenfield, Roy C.	C.E.	1903
Gregory, Brainerd E.	C.E.	1887
Gridley, Frank B.	C.E.	1903
*Gridley, V. H.	B.S. 1893, C.E.	1894
Grier, Charles A.	C.E.	1908
*Griffen, George S.	C.E.	1874
*Griffen, Henry R.	C.E.	1877
Griffith, Charles G.	C.E.	1877
Griggs, Albert, Jr.	C.E.	1910
*Grimes, Charles L.	C.E.	1871
*Grinnell, Frederick.	C.E.	1855
*Griswold, John W.	B.S.	1865
Groesbeck, Geo. S.	C.E.	1889
Gronau, William F.	C.E.	1887
Gross, Edward D. P.	M.E.	1913
Grove, Independence.	C.E.	1882
Guerra, Arturo.	C.E.	1876
*Guerrero, Carlos.	C.E.	1867
Gugerty, E. J.	C.E.	1899
Gunn, Frederick C.	C.E.	1887
*Gurley, Lewis E.	C.E.	1845
Gurley, Louis W.	C.E.	1882
*Gurley, William.	C.E.	1839
Guthrie, Vincent R.	C.E.	1913
Hack, Reuben C.	C.E.	1913
Hackett, Earl C.	C.E.	1906
*Haddock, Arba R.	C.E.	1862
Hahn, Carl H.	C.E.	1912
Haigh, Paul N.	E.E.	1913
Haight, H. DeR.	C.E.	1898
Haight, Theodore S.	C.E.	1885
Hailes, Theo. C., Jr.	C.E.	1907
Hailes, William D.	E.E.	1913
Hailman, James D.	C.E.	1887
Haite, William B.	C.E.	1913
Hale, Harry W.	C.E.	1907
*Hall, Fitzedward.	C.E.	1842
*Hall, George M.	C.E.	1849
*Hall, G. Thomas.	C.E.	1868
Hall, Harold J.	E.E.	1914
*Hall, James.	A.B.(r.s.)	1832

* Deceased.

NAME.	DEGREE.	CLASS.
Hall, John G	C.E.	1887
*Hall, William	C.E., B.N.S.	1846
Hallock, James C	C.E.	1891
Hallsted, James C	C.E.	1883
Halpin, George R	C.E.	1905
Hamill, Charles B	C.E.	1914
Hamill, Wm. S	C.E.	1904
Hamilton, Edward P	C.E.	1907
Hamilton, William E	C.E.	1910
Hammond, W. B	C.E.	1880
Hanley, Edward A	C.E.	1910
Haraguchi, Kaname	C.E.	1878
Hardesty, Shortridge	C.E.	1908
Hardy, Nathaniel W	C.E.	1914
Hardy, Norman G	C.E.	1910
Hardy, Roswell E	C.E.	1914
Haring, Alexander	C.E.	1895
*Harrison, R. Morley	C.E.	1879
*Harley, Henry	C.E.	1858
Harper, Abner M	C.E.	1907
*Harper, Albert M	C.E.	1867
Harris, Charles P	C.E.	1873
Harris, Ford W	C.E.	1907
*Harris, Henrique	T.E., C.E.	1860
Harris, Job F. W	C.E.	1903
*Harris, Joel B	C.E.	1841
Harris, William P	C.E.	1866
Harrison, Frank	C.E.	1888
Harrison, George A	C.E.	1910
Harrison, Mark J. J	C.E.	1913
Harrold, Thomas	C.E.	1887
Harvey, Thomas A	C.E.	1898
Hasbrouck, Oscar	C.E.	1905
*Haskell, Stephen E.	B.N.S., C.E.	1845
*Haskin, Abel N	B.N.S., C.E.	1840
*Haskin, Alfred B	C.E., B.N.S.	1840
*Haskin, Leonard W	C.E.	1841
Haskin, William L	C.E.	1861
Hassinger, William H	C.E.	1885
Haswell, Walter T	E.E.	1914
Hathaway, Neil F	C.E.	1912
Hauck, Albert L	C.E.	1886
*Hawley, Fletcher J.	C.E., B.N.S.	1837
Hawley, William C	C.E.	1886
Hayes, Francis V	C.E.	1911
Hayes, Harry R	C.E.	1909
Haynes, William D	C.E.	1913
Hayt, Stephen T., Jr	C.E.	1882
Hazlehurst, George H	C.E.	1910
Headden, William R	C.E.	1904
Healy, Frederic G	C.E.	1913
Healy, Wilbert M	C.E.	1914
Heaphy, Harry W	C.E.	1909
*Hearne, Frank J	C.E.	1867
Heath, John R	C.E.	1914
Hebard, Walter C	C.E.	1899
Hebert, Everett E	C.E.	1910
Hebert, Paul O	C.E.	1889
Hedden, Eugene B	C.E.	1885
Heer, William, Jr	C.E.	1907
Heerlein, Robert W	C.E.	1911
Heintze, Carl F	C.E.	1906
*Heizmann, Theodore I	C.E.	1859
Helwig, Eugene C	C.E.	1912
Hemphill, James M	C.E.	1907
*Henderson, William	C.E.	1876
Hendry, Johnson F	B.S.	1908
Henry, Earl C	C.E.	1911
Henry, Harold W	M.E.	1914
Henry, John J	C.E.	1881
Henry, Philip W	C.E.	1887
*Henry, William G	A.B.(r.s.)	1828
Henry William J., Jr	C.E.	1914
Hepburn, Fred T	C.E.	1893
Herden, Byron V	C.E.	1909
Hermann, Edward A	C.E.	1879
Hermans, Frank A., Jr	C.E.	1904
*Hernandez, Jose	C.E.	1867
Herzog, Christian J	C.E.	1913
*Hetzel, James	C.E.	1885
Hewes, Ralph W	C.E.	1913
Hewes, Virgil H	C.E.	1881
Heyl, Jacob E	B.S.	1870
Hicks, Ralph J	C.E.	1903

* Deceased.

NAME.	DEGREE.	CLASS.
*Hidley, Emerson G.	C.E.	1895
Higbee, Lester C.	C.E.	1912
*Hill, Augustus G.	A.B.(r.s.)	1831
Hilt, Fred K.	C.E.	1894
Himmelwright, A. L. A.	C.E.	1888
*Hinckley, Frank	C.E.	1863
Hine, Alfred B.	C.E.	1895
Hine, Samuel K.	B.S.	1892
Hinman, Archie S.	C.E.	1908
Hinrichs, Adolf	C.E.	1912
Hinsdale, Theodore R.	C.E.	1886
Hirai, Seijiro	C.E.	1878
Hitchcock, Dwight A.	C.E.	1886
Hoadley, Edward M.	C.E.	1889
Hoar, John C.	M.E.	1913
Hodge, Harry S.	C.E.	1878
Hodge, Henry W.	C.E.	1885
Hoeing, Joseph B.	C.E.	1876
Hoffmann, Philip J.	M.E.	1913
Holmes, Harry T.	C.E.	1901
*Holmes, Henry	C.E.	1855
Holmes, Lemuel, 2d.	C.E.	1898
Holmes, Lewis A.	C.E.	1907
Holt, Royden L.	C.E.	1904
*Holton, George C.	C.E.	1860
Homer, Langley S.	C.E.	1913
Hone, F. deP.	C.E.	1897
Hood, Richard H.	C.E.	1887
Hooker, Edward D.	C.E.	1900
*Hoover, John S.	C.E.	1906
Hopkins, Albert L.	C.E.	1892
*Hopkins, James B.	C.E.	1886
Hopkins, Lewis N., Jr.	C.E.	1903
*Hopkins, T. Orlando	C.E.	1857
*Hopkins, Theron R.	A.B.(r.s.)	1834
Hopkins, William T.	C.E.	1913
Horan, Frank W.	C.E.	1913
Horbach, Paul W.	C.E.	1886
Hormats, Myer	E.E.	1912
*Horsford, Eben N.	C.E.	1838
*Horton, George F.	A.B.(r.s.)	1827
Horton, George T.	C.E.	1893
*Horton, James S.	A.B.(r.s.)	1829
*Houghton, D.	A.B.(r.s.)	1829
*Houghton, J. F.	C.E.	1848
*House, Samuel R.	A.B.(r.s.)	1834
Houston, Livingston W.	M.E.	1913
Hover, Leland P.	C.E.	1908
Hovey, Paul G.	C.E.	1910
Howard, James W.	C.E.	1888
*Howard, Jerome B.	C.E.	1838
Hubbard, Ralph B.	E.E.	1913
Hubbell, George S.	C.E.	1886
Hughes, Lorne J. F.	C.E.	1905
Huhne, Carl A.	C.E.	1912
*Hulbert, Addison	A.B.(r.s.)	1826
Hulett, Mason	C.E.	1914
Hulings, Marcus	C.E.	1903
*Humphrey, Henry C.	C.E.	1887
Humphreys, Chas. R.	C.E.	1904
*Humphreys, John G.	C.E.	1873
Hunt, Charles N.	C.E.	1911
Hunt, Conway B.	C.E.	1882
*Hunt, George	C.E.	1858
*Hunt, George M.	C.E.	1866
Huntington, W. W.	C.E.	1876
Huntley, Grant	C.E.	1907
Huntley, R. L.	C.E.	1876
*Hurd, Tyrus W.	C.E.	1836
Hurley, Charles H.	C.E.	1908
Husband, Charles M.	C.E.	1906
Husband, James A.	C.E.	1910
Husband, John	C.E.	1902
Hutchins, Guy S.	C.E.	1913
Huth, Christian	C.E.	1910
Hutton, Frank C.	C.E.	1885
Huyck, Ansel B.	E.E.	1914
Hyde, Arthur L. V.	C.E.	1914
*Hyde, Charles B.	C.E.	1841
*Hyde, Douglass W.	C.E.	1841
Illingworth, George C.	C.E.	1911
*Illsley, Charles E.	C.E.	1867
*Ingham, Wm. A.	C.E., B.N.S.	1846
Inskip, John S.	C.E.	1910

* Deceased.

NAME.	DEGREE.	CLASS.
Irving, Walter E.	C.E.	1896
*Ishigro, Taro	C.E.	1881
*Jackson, Samuel C.	A.B.(r.s.)	1827
Jacobs, Fred P.	C.E.	1903
Jaggard, Herbert A.	C.E.	1889
James, Merton E.	C.E.	1904
James, Winfield S.	C.E.	1905
Jarrett, Edwin S.	C.E.	1889
Jeffers, William W.	C.E.	1892
Jenkins, James E.	C.E.	1904
Jenkins, Lewis L.	C.E.	1882
*Jennings, Henry C.	C.E.	1879
*Jenny, Joseph H.	C.E.	1841
Jewett, Charles H.	C.E.	1885
Johnson, Clarence L.	E.E.	1913
*Johnson, George.	C.E., B.N.S.	1837
*Johnson, Isaac G.,	B.N.S., C.E.	1848
Johnson, James M.	C.E.	1879
Johnson, Lancelot L.	C.E.	1907
Johnson, Lewis H.	C.E.	1908
Johnston, Andrew C.	C.E.	1908
Johnston, Edsall R.	C.E.	1914
Johnston, Stewart,	C.E.	1887
*Johnston, Thomas T.	C.E.	1877
Johnstone, Clifford S.	C.E.	1913
Jones, George H.	C.E.	1909
Jones, Walter E.	C.E.	1901
Jones, Walter S.	C.E.	1893
Jones, William L.	C.E.	1911
Jorjorian, H. K.	C.E.	1904
Jova, Joseph L.	C.E.	1907
Joyes, Watson B.	C.E.	1911
Judd. Harry E.	C.E.	1902
*Judson, Charles T.	C.E.	1875
Just, George A.	C.E.	1881
Kast, Clarke N.	C.E.	1900
Kaufman, Gustave	C.E.	1880
Kay, Edgar B.	C.E.	1883
Kay, William G.	C.E.	1875
Keenan, John J.	C.E.	1888
*Keeney, John C.	A.B.(r.s.)	1827
Keis, Francis J.	C.E.	1906
Keller, G. A.	C.E.	1899
Kelley, George B.	C.E.	1895
*Kellogg, E. R.	C.E., B.N.S.	1841
*Kellogg, Nathan	C.E.	1841
Kellogg, Norman B.	C.E.	1873
Kellogg, Warren T.	C.E.	1861
Kelly, John F.	C.E.	1910
*Kelly, John P.	C.E.	1876
Kelly, Walter L.	C.E.	1904
Kemp, Edward J.	C.E.	1898
Kemp, William, 2nd	C.E.	1913
*Kendall, David	C.E.	1838
Kennedy, John H.	C.E.	1908
Kibbe, Augustus S.	C.E.	1886
Kiersted, Wynkoop	C.E.	1880
Kilbourne, Edward W.	C.E.	1885
Kilby, Charles C.	C.E.	1911
Kilmer, Winton W.	C.E.	1911
Kimball, F. N.	C.E.	1886
Kimberly, J. A., Jr.	C.E.	1889
Kimmey, Elda L.	C.E.	1909
*King, William J.	C.E.	1880
Kingman, John A.	C.E.	1897
*Kingman, L. H.	A.B.(r.s.)	1829
Kingsley, Charles B.	C.E.	1908
*Kingsley, James C.	C.E.	1876
Kingsley, John E.	C.E.	1912
Kinloch, Donald H.	C.E.	1914
Kinne, George W.	C.E.	1900
*Kirby, George F.	C.E.	1857
Kirtland, Alfred P.	C.E.	1871
Kirtland, Elmour F.	C.E.	1894
Klemm, Edward S.	C.E.	1914
Kline, Homer C.	C.E.	1902
Knap, Joseph M.	C.E.	1858
*Knap, Thomas L.	C.E.	1866
Knapp, George O.	C.E.	1876
Kneass, E., M.E., 1913,	M.M.E.,	1914
*Kneass, Strickland	C.E.	1839
Kneass, Strickland, Jr.	M.E.	1911
Kneass, Strickland L.	C.E.	1880
*Knickerbacker, H., Jr.	C.E.	1887

* Deceased.

NAME.	DEGREE.	CLASS.
Knickerbacker, John	C.E.	1886
Knowlton, T. E	C.E.	1893
Koch, Albert F	C.E.	1897
Koerner, F. C., Jr	C.E.	1906
Koerner, Julius F	C.E.	1911
Kohlhofer, Adolph J	C.E.	1912
Kohn, William O	C.E.	1913
Korschen, John A., Jr	C.E.	1906
Koss, George W	C.E.	1901
Kraft, William F	C.E.	1910
*Krause, Conrad B	C.E.	1879
Krauss, John P	C.E.	1905
Kreischer, Gustav A	C.E.	1897
Kreiger, G. W., Jr	C.E.	1907
Kulp, Burr R	C.E.	1905
Kummer, Frederic A	C.E.	1894
Kuntz, Guy T	C.E.	1911
Kuys, Andrew T	C.E.	1913
Lacerda, Augusto de	B.S.	1855
La Chicotte, Henry A	C.E.	1885
*La Coste, Louis	C.E.	1841
Laflin, Louis E	C.E.	1882
*Lally, James	C.E.	1861
Lamb, Andrew F	C.E.	1912
Lanagan, Frank R	C.E.	1905
Landor, Edward J	C.E.	1876
Langdon, W. C	C.E.	1897
Lane, Edward V. Z	C.E.	1875
Lane, Leland T	C.E.	1899
Lapeyre, James M	C.E.	1892
*Lapham, William G	C.E.	1838
Larmon, Frank P	C.E.	1900
Lavandeira, Antonio	C.E.	1877
Lawlor, Joseph M	C.E.	1888
Lawlor, Thomas F	C.E.	1886
*Lawrence, B. R	B.S.	1868
Lawson, Thomas R	C.E.	1898
*Lawton, Frederick B	C.E.	1891
*Lay, Henry C	C.E.	1875
Lea, George H	C.E.	1872
Lee, Chester S	C.E.	1909
Leaming, Thomas H., Jr	B.S.	1914

NAME.	DEGREE.	CLASS.
Leibee, Hugh C	C.E.	1907
Leland, John P., Jr	C.E.	1902
Leme, Luiz G. da S	C.E.	1880
Lempe, Fred J	C.E.	1893
*Lent, George B	C.E.	1838
Leonard, Vreeland Y	E.E.	1912
*Lesley, Alexander M	B.N.S.	1846
*Leverich, Gabriel	C.E.	1857
Lewis, Harold M	C.E.	1912
Lewis, Nelson P	C.E.	1879
*Lewis, William	C.E., B.N.S.	1840
*Lilienthal, B.N	C.E.	1866
*Lindsley, Aaron L	C.E.	1842
Lippincott, Jason E	C.E.	1883
Lippitt, William F., Jr	C.E.	1913
Lippitt, William P. C	C.E.	1911
Litter, F. J	C.E.	1898
Livingston, Benjamin S	C.E.	1912
Llano, Antonio	C.E.	1890
Lo, King Tai	C.E.	1914
*Locke, Elmer H	B.N.S.	1848
Lockhart, John M	C.E.	1887
*Lockling, Levi L.	C.E., B.N.S.	1837
Lockwood, Le Roy V	C.E.	1912
*Long, Thomas J	C.E.	1873
*Loomis, Charles L	C.E.	1851
Loomis, Horace	C.E.	1865
Loomis, Leon C	C.E.	1912
Loucks, Eugene C	C.E.	1912
Loughran, James F	C.E.	1906
Love, Malcolm E	C.E.	1913
Low, Samuel B	C.E.	1876
Lowe, Jesse	C.E.	1885
*Lowe, Lewis G	C.E., B.N.S.	1848
*Lowrey, Goodwin	C.E., B.N.S.	1845
Lozier, William S	C.E.	1906
*Luaces, Ernesto L	C.E.	1867
Ludden, Edmond F	C.E.	1909
Ludwig, Julius Alfred	C.E.	1889
Luebeck, Alfred	C.E.	1912
Lush, Cuyler W	C.E.	1905
Lyall, William H	C.E.	1914

* Deceased.

NAME.	DEGREE.	CLASS.
Lynch, Francis J.	C.E.	1912
Lyon, Percy E.	C.E.	1898
Lyons, Francis R.	C.E.	1914
*Mabbett, Henry J.	A.B.(r.s.)	1833
MacCurdy, George L.	C.E.	1914
Macdonald, Allan F.	C.E.	1912
Macdonald, Charles	C.E.	1857
MacEwan, Fred L.	C.E.	1908
Macfarlane, Graham	C.E.	1872
MacGregor, George C.	C.E.	1871
Machin, Sergio E.	C.E.	1914
*Mackay, D. W., C.E. 1897,	B.S.	1898
Macken, Dalton K.	E.E.	1914
Mackenzie, Gardner E.	M.E.	1913
Mackey, Scott W.	B.S.	1913
Macksey, Henry V.	C.E.	1886
MacPherson, J. A., Jr.	C.E.	1894
Mader, Arthur B.	C.E.	1890
Magary, Olin J.	C.E.	1913
Magor, Basil	C.E.	1894
Maguire, James B.	C.E.	1894
Malcolm, Thomas C.	C.E.	1911
Mallary, Harold T.	C.E.	1912
Mallory, George B.	C.E.	1867
Mallory, Marshall H.	C.E.	1865
Man, Albon P.	C.E.	1866
Mandl, Robert	C.E.	1907
Manier, Ralph L.	M.E.	1914
Mann, Elias P.	C.E.	1872
*Mann, George H.	C.E.	1870
Manning, W. J. H.	C.E.	1911
*Mansfield, M. W.	C.E.	1871
Manss, Walter A.	B.S.	1914
Mantica, Albert J.	C.E.	1912
Manville, C. Rollin	C.E.	1880
Manzanilla, Joaquin M.	C.E.	1909
Manzanilla, Joseph J.	C.E.	1909
Marburg, Edgar	C.E.	1885
Marcy, William	B.S.	1893
Markham, William C.	C.E.	1904
*Marks, J. Harrod	C.E.	1871
Marlett, S. H.	C.E., B.N.S.	1841
Marling, William	C.E.	1872
Marsh, Emmett L.	C.E.	1906
Marshall, Joseph P.	C.E.	1903
Marshall, Thomas F.	C.E.	1867
Marstrand, O. Julius	C.E.	1882
Martin, A. K., C.E. 1907,	B.S.	1909
*Martin, Charles C.	C.E.	1856
*Martin, Jesse A.	C.E.	1900
Martin, John L.	C.E.	1894
*Martin, William H.	C.E.	1856
Martinez, Eladio A.	C.E.	1907
Martinez, Jesus C.	M.E.	1913
Martinez, Manuel C.	C.E.	1910
Martins, Jose C.	C.E.	1886
Maruri, Alberto	C.E.	1913
Mason, William P.	C.E.	1874
*Masses, Jose D.	C.E.	1882
*Masten, Cornelius S.	C.E.	1850
Masters, Perrin M.	C.E.	1914
*Matas, Ramon	T.E.	1860
*Mather, Charles R.	M.E.	1870
Matlaw, Isaac S.	C.E.	1905
*Matsmoto, Souichiro	C.E.	1876
Matteson, Park F.	C.E.	1908
Matthews, Irving E.	C.E.	1887
Maude, Harvey T.	C.E.	1911
Mauldin, Thomas S.	C.E.	1891
Maxwell, John W.	C.E.	1910
*Maxwell, William B.	C.E.	1875
May, G. Earl	C.E.	1912
*May, John E.	C.E.	1846
Mayer, Eugene S.	C.E.	1908
Mayott, Clarence W.	E.E.	1911
McBride, John	C.E.	1907
McBride, William	C.E.	1899
McCarthy, George T.	C.E.	1912
McCartney, W. M.	C.E.	1894
*McCaughin, John	C.E.	1842
McCauley, Frank W.	C.E.	1909
*McClellan, Henry G.	C.E.	1869
McClellan, Philip F.	C.E.	1903
McClellan, William	C.E.	1911

* Deceased.

NAME.	DEGREE.	CLASS.	NAME.	DEGREE.	CLASS.
McClelland, Wilson	C.E.	1886	Merritt, Charles E	C.E.	1909
McClintock, Hugh P	C.E.	1880	Mesnard, Howard W	C.E.	1897
McClure, Donald C	E.E.	1913	*Metcalf, J. B	A.B.(r.s.)	1829
McCollum, John A	C.E.	1898	*Metcalf, William	C.E.	1858
McComb, Edward C	C.E.	1887	*Miller, Athol M., Jr	C.E.	1895
McCord, William S	C.E.	1881	Miller, Harold J	C.E.	1912
McCorkindale, Roy E	C.E.	1914	Miller, H. Eugene	C.E.	1909
McCrory, Sol	C.E.	1903	Miller, Leverett S	C.E.	1885
McCune, Frederick S	C.E.	1909	Miller, Malcolm S	C.E.	1909
McDonough, Charles J	C.E.	1897	Miller, P. S	B.S.	1897
McGee, Charles C	C.E.	1906	*Miller, S. V. R	C.E.	1841
McGiffert, Crosby J	C.E.	1909	Miller, Wm. J	C.E.	1904
McGiffert, James	C.E.	1891	*Millet, Albert H	C.E.	1867
McGuire, James C	C.E.	1888	Milliman, Charles F	C.E.	1908
McHarg, Arthur V. A	C.E.	1892	Millington, Howard G	C.E.	1908
McKaig, Alvin W	E.E.	1914	Mills, Hiram F	C.E.	1856
McKay, George A	C.E.	1894	Mills, William W	C.E.	1868
*McKee, Aaron G	C.E.	1836	*Mimmack, Oliver C	C.E.	1898
*McKee, Robert G	C.E.	1835	Mincher, J. Edward	C.E.	1909
McKelvy, Jeremiah D	C.E.	1914	Mitchell, Horace H	C.E.	1887
McKelvy, William E	C.E.	1896	Miter, Harry F	C.E.	1899
McKinney, Samuel P	C.E.	1884	*Moak, Joseph A	C.E.	1854
*McKnew, William H	C.E.	1878	Molina, Ricardo V	C.E.	1887
McLaren, Daniel	C.E.	1878	Moliner, Julio S	C.E.	1888
McLean, John	C.E.	1876	Monteagudo, Humberto,	C.E.	1913
*McManus, P.C.W.T.,	A.B.(r.s.)	1826	Montero, Julio D	C.E.	1905
McMillan, Charles	C.E.	1860	Montfort, Barret	C.E.	1913
McMullen, Frederick E	M.E.	1914	Montgomery, Neil R	C.E.	1885
McMullen, William A	C.E.	1914	*Montony, Liberty G	C.E.	1890
McNaugher, David W	C.E.	1885	Moore, Arthur E	M.E.	1912
McNaughton, Wm. C	C.E.	1914	Moore, Frank L	C.E.	1867
*McNeill, Elmore B	C.E.	1881	Moore, George R	C.E.	1909
*Mearns, Louis Z	C.E.	1909	Moore, George W., Jr	C.E.	1914
Megear, Alter	C.E.	1868	Moore, Marshall G	C.E.	1884
Melchert, A. C. d'A	C.E.	1886	Moore, Samuel A	C.E.	1901
Menard, George A	C.E.	1910	Morey, Edward F	C.E.	1911
Mendoza, V. G. de	C.E.	1888	Morgan, Charles N	C.E.	1906
*Menocal, A. G	C.E.	1862	Morgan, Jas. W	C.E.	1903
*Menocal, Arturo N	C.E.	1881	Morris, Charles W., Jr.,	C.E.	1904
*Merian, Henry W	C.E.	1858	Morris, T. O'N	C.E.	1870
Meron, Leo A	C.E.	1910	*Morse, Henry G	C.E.	1871
*Merrifield, Paul S	C.E.	1878	*Morton, Nathaniel	C.E.	1850

* Deceased.

NAME.	DEGREE.	CLASS.
Mosher, Wilson A.	C.E.	1911
Mosley, Frederick	C.E.	1910
*Moss, Charles H.	C.E.	1867
Moylan, Leonard K.	C.E.	1909
*Mullin, A. T. E.	C.E.	1861
*Mullin, Joseph	C.E.	1869
*Munoz del Monte, A. C.	C.E.	1886
Munoz del Monte, L. E.	C.E.	1888
Murdock, Charles W.	C.E.	1912
Murphy, Edward T.	C.E.	1905
*Murphy, J. W.	B.N.S., C.E.	1847
Murnane, Thomas A.	C.E.	1913
Murray, John C.	C.E.	1909
Murray, Jo D.	C.E.	1892
Murray, Patrick H.	C.E.	1904
Murray, Robert J.	C.E.	1900
Murtland, De Loss	C.E.	1908
Myer, Edgar A.	C.E.	1901
Myers, Chester J.	C.E.	1900
Myers, John H.	C.E.	1893
*Mynderse, Edward	C.E.	1838
Myton, John D.	C.E.	1905
Naranjo, Francisco R.	C.E.	1863
Nathan, Harry	C.E.	1907
*Neal, Robert C.	M.E.	1870
Neel, Charles H.	C.E.	1906
*Neilson, Robert	C.E.	1861
*Nelles, George T.	C.E.	1877
Nellis, Dan H.	C.E.	1892
Nellis, Russell V.	C.E.	1912
Neuhaus, Hugo V.	C.E.	1905
Nevarez, Jose R.	C.E.	1907
Newbold, Thomas E.	C.E.	1882
Newton, John P.	C.E.	1903
Nial, William A.	C.E.	1899
*Nichols, Edward	B.S.	1871
*Nichols, Othniel F.	C.E.	1868
Nicholson, William A.	C.E.	1877
Nickel, George D.	M.E.	1870
*Nickerson, J. G.	B.N.S.	1848
Nier, John W.	C.E.	1876
Nor Dell, C. Eric	C.E.	1912
Norris, Aleck J.	C.E.	1886
North, Earl P.	C.E.	1904
Norton, James G.	C.E.	1912
*Northrup, Arthur L.	C.E.	1900
Nugent, Paul C.	C.E.	1892
*Oakley, James	C.E.	1837
*Oatman, Orlin	A.B.(r.s.)	1827
O'Brien, Richard V.	C.E.	1912
O'Brien, Robert J., Jr.	B.S.	1900
O'Brien, Thomas S., Jr.	C.E.	1909
O'Brien, William F.	C.E.	1901
O'Connell, John J. F.	E.E.	1913
Oliver, Frank G.	C.E.	1906
*Olmstead, A. B.	C.E., B.N.S.	1837
Olmstead, Harry L.	C.E.	1894
*Olmstead, L. G.	A.B.(r.s.)	1830
Oliphant, E. C.	C.E.	1903
*Olyphant, H. V.	C.E.	1868
Ortega, Angel A. P.	C.E.	1913
Orth, Edward L.	C.E.	1899
*Osborn, Charles M.	C.E.	1853
Osborn, Frank C.	C.E.	1880
*Osborn, George K.	A.B.(r.s.)	1830
Osborn, Kenneth H.	C.E.	1908
Ostrander, Vibert L.	C.E.	1908
*Ostrom, John	C.E.	1857
O'Sullivan, T. J. A.	C.E.	1910
Otto, John B.	C.E.	1871
Overbaugh, Elbert S.	C.E.	1911
Overocker, Daniel W.	C.E.	1907
Packard, Ralph G.	C.E.	1864
Padron, Augustin	M.E.	1914
*Painter, A. E. W.	C.E.	1863
Painter, Edward L.	C.E.	1884
Painter, Herbert B.	C.E.	1891
Palmer, Miguel C.	C.E.	1894
Palsgrove, Grant K.	M.E.	1911
*Pardee, Ario, Jr.	C.E.	1858
Pardee, Calvin	B.S.	1860
Parish, Wainwright	C.E.	1888
*Park, Austin F.	C.E., B.N.S.	1840
Parker, Charles M.	C.E.	1889

* Deceased.

NAME.	DEGREE.	CLASS.
Parker, Earle D	C.E.	1911
*Parkinson, John B	C.E.	1876
Parks, Albert F	C.E.	1891
Parks, Charles W	C.E.	1884
Parks, Ralph N	C.E.	1910
Parrish, Edward	C.E.	1870
Parsons, Charles W	C.E.	1909
Parsons, LeRoy U	C.E.	1904
*Parsons, Samuel B	C.E.	1840
Partenfelder, Gustav A.	C.E.	1911
Parthesius, Henry J	M.E.	1912
Parthesius, Philip H	C.E.	1904
*Paterson, S. V. R	C.E.	1836
Patten, Henry B	C.E.	1878
*Pattison, Harry D	C.E.	1874
Paul, Leland E	C.E.	1914
*Pearce, Allen	C.E.	1838
Pearl, James W	C.E.	1880
Pease, Charles S	C.E.	1876
*Peck, Hollam L	C.E.	1849
Peck, John C	C.E.	1908
Peck, William A	C.E.	1869
*Peebles, Robert C	C.E.	1869
Peek, Jesse H	C.E.	1912
*Pelaez, Manuel A	C.E.	1873
Pelletier, Daniel S	C.E.	1912
*Pelton, William S	A.B.(r.s.)	1826
*Pemberton, John	C.E.	1860
*Penfield, James A	B.N.S.	1846
*Percy, James R	C.E.	1859
Perkins, Charles P	C.E.	1866
Perrin, Leonard A	C.E.	1912
Perry, John S	C.E.	1911
Perry, Thornton T	C.E.	1885
Peterson, B. Walker	C.E.	1873
Petteys, Jay D	C.E.	1911
*Pettibone, C. Vallette	C.E.	1867
Pfau, Julius W	C.E.	1899
Pfohl, Harold F. L	C.E.	1913
Pfohl, Leland J	C.E.	1913
Phelps, Guy M	C.E.	1909
*Philip, John H	A.B.(r.s.)	1832
*Philip, John V. N	B.N.S.	1839
*Pierce, George H	C.E.	1858
*Pierpont, John	M.E.	1869
*Pike, Samuel J	A.B.(r.s.)	1830
*Piraja, J. R. da S., Jr.	C.E.	1865
Pitz, Hugo E	C.E.	1904
Platt, Elbert S	B.S.	1899
Platt, Frank E	C.E.	1879
*Platt, Joseph C	C.E.	1866
*Platt, Merritt	A.B.(r.s.)	1830
Plogsted, Walter J	C.E.	1903
Plumb, James Ives	C.E.	1886
Plummer, George C	C.E.	1892
*Plympton, George W	C.E.	1847
Podmore, Jas. C	C.E.	1903
Podmore, John M	C.E.	1896
Polanco, Benigno C	C.E.	1904
Polk, Armour C	C.E.	1903
*Pomeroy, Halsey B	C.E.	1887
*Pomeroy, Henry,	C.E., B.N.S.	1841
Pond, Frank	C.E.	1875
Pope, Lathrop C	C.E.	1913
Popp, Harry E	M.E.	1912
Popp, William J	C.E.	1909
Porter, Chester D	C.E.	1906
Porter, Frank D	C.E.	1906
*Post, James H	C.E.	1839
*Potter, Charles F	C.E.	1878
*Potter, Clarkson N	C.E.	1843
Potter, Henry W	C.E.	1879
*Potter, George C	C.E.	1839
Potter, Winfield S	C.E.	1890
*Potts, Benjamin C	C.E.	1863
Powell, Ambrose V	C.E.	1868
Powell, J. R.	C.E., B.N.S.	1846
Powell, Marcus	C.E.	1889
*Powell, William J	C.E.	1839
*Powers, Joseph A	C.E.	1880
Powless, William H	C.E.	1874
Pratt, Arthur W	C.E.	1904
*Pratt, Charles S	C.E.	1883
*Pratt, Ira R	C.E., B.N.S.	1842

* Deceased.

NAME.	DEGREE.	CLASS.
Pratt, Robert J	C.E.	1883
Pratt, William M	C.E.	1857
*Prescott, Richard	M.E.	1871
Price, Victor T	C.E.	1888
*Prime, Alanson J	A.B.(r.s.)	1829
Prior, John M	C.E.	1909
*Pruyne, DeForest	C.E.	1876
Puffer, Louis B	C.E.	1909
Pujals, Francisco	C.E.	1909
*Putnam, George	C.E.	1838
*Quackenbush, J. H	C.E.	1856
*Quest, George F	C.E.	1904
Quinn, Michael J	C.E.	1913
*Quintana, Manuel P	C.E.	1885
Quirk, James F	C.E.	1901
Raban, Reginald J	C.E.	1904
Rabe, Louis F	C.E.	1902
*Rae, Charles W	C.E.	1866
Raht, Adolphus W	C.E.	1877
Rainsford, Thos. H	C.E.	1881
Ralli, Victor P	M.E.	1913
*Ralston, John B	C.E.	1888
Ramsay, David	C.E.	1903
Randolph, John H	C.E.	1870
Rankin, John Q	C.E.	1904
Ranney, Charles G	C.E.	1904
Ranney, Marcus H	C.E.	1885
Ranney, Willet G	C.E.	1890
Raster, Walther	C.E.	1900
*Ray, Francis A	C.E.	1895
*Raymond, Charles T	C.E.	1879
Raymond, Harvey J	C.E.	1914
Raymond, Thomas C	C.E.	1865
Raynolds, James D	C.E.	1870
Raynsford, George M	C.E.	1906
Redfield, James A. S	C.E.	1898
Reed, Charles C	C.E.	1907
*Reed, James	C.E.	1873
Reed, Lloyd J	B.S.	1914
Reed, Paul L	C.E.	1894
Reed, Robert B	C.E.	1907
Reeves, David	C.E.	1872
Reeves, William H	C.E.	1873
Reichard, Wade H	C.E.	1905
Reilly, J. R	B.S.	1890
*Reinholdt, K. Oake P	C.E.	1890
Reinicker, Charles E	C.E.	1908
Rementer, George L	C.E.	1884
Renshaw, Alfred H	C.E.	1883
Reyes, Octavio M	C.E.	1895
Reynders, J. V. W	C.E.	1886
Reynolds, Edwin G., Jr.	C.E.	1911
Reynolds, Francis B	C.E.	1904
Reynolds, Winfred E	C.E.	1903
Rice, Dan, Jr	C.E.	1892
Rice, Edward Y	E.E.	1911
*Rice, Joseph G	C.E.	1858
*Rice, L. Frederick	C.E.	1858
*Rice, Spencer V	C.E.	1871
Rich, Edward D	C.E.	1895
Richardson, Harry L	C.E.	1875
Richardson, Norman D	C.E.	1913
Ricketts, Palmer C	C.E.	1875
Rickey, James W	C.E.	1894
*Riddell, John L	A.B.(r.s.)	1829
*Rider, J. B	B.N.S., C.E.	1844
Rider, Joseph B	C.E.	1889
*Rider, Thomas B	C.E.	1845
Ridgely, William B	C.E.	1879
Riggs, Stephen	C.E.	1912
Riker, George N	C.E.	1908
Rinearson, Horace W	C.E.	1909
*Ripley, Thomas C	A.B.(r.s.)	1828
Roberts, George	B.S.	1888
*Roberts, Geo. B	C.E., B.N.S.	1849
*Roberts, Percival	B.N.S., C.E.	1846
Roberts, Stanley A	C.E.	1905
Robinson, A. W	C.E.	1897
Robinson, Drew K	B.S.	1897
*Robison, John A	B.N.S.	1838
*Rocha, Alfredo F. da	C.E.	1891
Rocha, E. da Dias	C.E.	1891
Roche, Alfred E	C.E.	1907
Rock, Chalmer R	E.E.	1911

* Deceased.

NAME.	DEGREE.	CLASS.
Rock, Paul C.	E.E.	1912
Rockefeller, S. V. N.	C.E.	1908
*Rockenstyre, Porter	C.E.	1849
Rockwell, James V.	C.E.	1898
Rockwood, Arthur J.	C.E.	1887
Rockwood, Charles F.	C.E.	1894
Roebling, Charles G.	C.E.	1871
Roebling, John A.	C.E.	1888
Roebling, W. A.	C.E.	1857
Rogers, Charles E.	C.E.	1896
Rogers, Clarence M.	C.E.	1903
*Rogers, Horace N.	C.E.	1837
Rogers, William A.	C.E.	1909
Rood, Henry M.	C.E.	1885
*Root, Bennett F.	A.B.(r.s.)	1826
*Ropes, Charles F.	M.E.	1871
Rosa, George de la	C.E.	1886
Rosa, Luis de la	C.E.	1885
Rose, Alston O.	C.E.	1911
Rosenberg, Friedrich	C.E.	1882
*Rossman, Augustus	C.E.	1847
*Rothwell, Richard P.	C.E.	1858
Rousseau, Harry H.	C.E.	1891
Rousseau, W. W., Jr.	C.E.	1895
*Rowland, Frank L.	C.E.	1875
*Rowland, Henry A.	C.E.	1870
Roy, Charles P.	C.E.	1893
Roy, Lawrence	C.E.	1891
Royce, Harrison A.	C.E.	1859
Royer, Harry B.	C.E.	1912
Rubio, Francisco	C.E.	1907
Rudd, Edward I.	C.E.	1905
Ruggles, Charles H.	C.E.	1892
Rumpf, Charles P.	C.E.	1912
Rummel, Philip C., Jr.	E.E.	1914
Rumsey, Carroll L.	C.E.	1898
Ruple, Commodore P.	C.E.	1881
*Russell, Nathaniel E.	C.E.	1870
Russell, Samuel R.	C.E.	1904
Ruth, Edgar K.	C.E.	1909
Ryan, James A.	E.E.	1913
*Rynning, Albert J.	C.E.	1905
Sabbaton, Frederic A.	C.E.	1892
Sabin, Alpheus T.	C.E.	1878
*Sage, Russell, 2d	C.E.	1859
*Sager, Abram	A.B.(r.s.)	1831
*Salisbury, James H.	B.N.S.	1846
Salisbury, Richard H.	C.E.	1914
Sallans, George A.	C.E.	1904
Salle, George V.	C.E.	1904
Salles, Joaquim de	C.E.	1879
*Saltar, John, Jr.	C.E.	1867
Samper, Julio	C.E.	1880
Sanchez, Rafael G.	C.E.	1904
Sanders, Francis N.	C.E.	1891
*Sanders, William S.	A.B.(r.s.)	1833
Sanderson, Edwin N.	C.E.	1886
*Sanderson, J. G.	C.E.	1858
*Sanford, Edward	A.B.(r.s.)	1827
Sariol, Pompeyo	C.E.	1867
Satterlee, Levi H.	E.E.	1913
Saulles, Arthur B, de	B.S.	1859
Sawyer, Guy H.	C.E.	1904
Sax, Percival M.	C.E.	1890
Saxe, V. R. P.	C.E.	1905
*Saylor, Francis H.	C.E.	1867
Scanlon, James F.	C.E.	1909
Scarborough, Francis W.	C.E.	1888
Schade, Charles G.	C.E.	1892
Schaeffer, John S.	C.E.	1866
Schedler, Carl W.	C.E.	1910
Scheer, Albert, Jr.	E.E.	1913
Scheer, C. H. E.	E.E.	1914
Schermerhorn, H. O.	C.E.	1903
Schermerhorn, Richard	C.E.	1871
Schneider, William W.	C.E.	1912
Schoen, Harry H.	C.E.	1911
Schoepf, Theodore H.	C.E.	1898
*Schott, C. Ridgely	C.E.	1868
Schulte, Gerd H.	C.E.	1908
Schultze, Paul	C.E.	1891
Schumann, Carl J.	C.E.	1902
Schutz, Wallace S.	M.E.	1914
Schwartz, Fred W.	B.S.	1905

* Deceased.

NAME.	DEGREE.	CLASS.
Scobey, Jesse C.	C.E.	1895
Scott, Charles H.	M.E.	1870
Scott, Charles K.	C.E.	1913
Scott, Horace L.	C.E.	1909
Scott, John K.	C.E.	1906
Scott, Walter V.	C.E.	1909
Scullen, Anthony J.	C.E.	1911
Searle, Robert A.	C.E.	1909
Searles, William H.	C.E.	1860
Sebast, Frederick M.	E.E.	1913
*Sedley, Henry	C.E.	1848
See, George C.	C.E.	1905
Seibert, Charles J.	C.E.	1911
Seitz, Cecil F.	C.E.	1912
*Selden, Samuel F.	C.E.	1886
Selig, Joseph E.	C.E.	1913
Seligman, Albert J.	C.E.	1878
Semans, Frank W.	M.E.	1914
Seminario, Juan	C.E.	1878
*Serrano, Aurelio	C.E.	1860
Seymour, Edward D.	E.E.	1912
Shankey, Joseph I.	C.E.	1912
Shankland, Edward C.	C.E.	1878
Shankland, Ralph G.	C.E.	1909
Shannahan, John N.	C.E.	1894
Sharp, Henry S.	C.E.	1913
Sharp, Howard O.	C.E.	1914
Sharp, William G.	C.E.	1879
Shaw, Henry C.	C.E.	1876
*Shaw, Richard E.	C.E.	1878
Sheafer, Paul T.	C.E.	1911
Sheal, Robert E.	C.E.	1894
Shearer, Welcome H.	M.E.	1912
Sheffield, John	C.E.	1891
Shepherd, Willard F.	C.E.	1878
Sherman, William B.	C.E.	1872
Sherrerd, Morris R.	C.E.	1886
Sherrerd, Samuel H.	C.E.	1907
*Sherrill, Rush	A.B.(r.s.)	1830
Sherwood, Aaron W.	C.E.	1905
Shields, Howard H.	B.S.	1886
Shields, James W.	C.E.	1890
Shoemaker, Harry	C.E.	1904
Shorey, Thomas R.	C.E.	1911
Sias, Robert M.	C.E.	1905
Sibbald, Charles T. A.	C.E.	1912
Sibbald, John O.	C.E.	1906
Sibley, Stanley D.	C.E.	1914
Sikes, George R.	C.E.	1886
Sill, Frederick DeV.	C.E.	1907
*Silliman, Justus M.	M.E.	1870
Simonds, George L.	C.E.	1901
*Simpson, Benjamin V.	C.E.	1879
Simpson, William S.	B.S.	1860
Singer, Robert R.	C.E.	1877
Sipperley, Charles L.	E.E.	1913
Skilton, George S.	C.E.	1868
*Skilton, James A.	B.N.S.	1845
*Skilton, Julius A.	B.N.S.	1849
*Slade, Israel	C.E., B.N.S.	1836
Slagle, W. C. H.	C.E.	1892
Slatcher, Alfred G.	C.E.	1908
*Sloan, Robert I.	C.E.	1859
*Small, Thos. B.	B.N.S., C.E.	1843
Small, Warren D.	M.E.	1912
*Smalley, D. S.	B.N.S., C.E.	1835
Smith, Charles E.	C.E.	1860
Smith, Charles R.	C.E.	1878
*Smith, David C.	A.B.(r.s.)	1833
Smith, Felix R. R.	C.E.	1860
*Smith, Frank G.	C.E.	1859
Smith, H. DeWitt	C.E.	1875
Smith, H. Dutton	C.E.	1912
Smith, Harmon M.	C.E.	1892
Smith, Harrison	C.E.	1905
Smith, James A.	C.E.	1912
Smith, Jerome F.	C.E.	1913
Smith, Kirby	C.E.	1910
Smith, Milo A.	C.E.	1867
Smith, Norman M.	C.E.	1909
Smith, Pemberton	C.E.	1888
Smith, S. Kedzie	C.E.	1886
*Smith, T. Guilford	C.E.	1861
*Smith, Thaddeus S.	C.E.	1861

* Deceased.

NAME.	DEGREE.	CLASS.
*Smith, Theodore S., Jr.	C.E.	1868
Smyth, Arthur P.	C.E.	1910
Snyder, Arthur C.	C.E.	1911
Snyder, Bert M.	C.E.	1914
Snyder, Donald D.	C.E.	1912
*Snyder, Henry R.	C.E.	1837
Sola, Francisco de, y B.	C.E.	1905
Solomon, Gabriel R.	C.E.	1902
Sooysmith, Charles	C.E.	1876
Soper, George A.	B.S.	1895
*Sosa, Pedro J.	C.E.	1873
Sothers, Edward	M.E.	1870
Southard, Herbert	C.E.	1912
Spalding, Ralph D.	C.E.	1913
*Spearman, Francis	C.E.	1884
Spencer, Herbert	C.E.	1903
Spengler, John H.	C.E.	1909
Sperling, Thomas G.	C.E.	1914
Sperry, Earl E.	C.E.	1904
*Springer, Lewis H.	C.E.	1887
Sproat, Frank R.	C.E.	1912
Squires, John	C.E.	1869
Stahl, Frederick A.	C.E.	1914
*Stannard, Harry E.	C.E.	1896
Stanley, Walter P.	C.E.	1907
Stanton, Chas. B.	C.E.	1903
*Stanton, Lodowick, Jr.	C.E.	1841
Stanton, Wilbor D.	C.E.	1904
*Starbuck, George H.	C.E.	1840
Stark, George H.	C.E.	1913
Starr, Arthur B.	C.E.	1869
*Stearns, George A.	C.E.	1849
Stearns, Irving A.	M.E.	1868
*Stebbins, Orrin	C.E., B.N.S.	1839
Steele, William M.	C.E.	1901
Steenburgh, Chas. G.	C.E.	1904
Stein, Benjamin	C.E.	1911
Steinberg, Louis J.	C.E.	1913
Steinle, John G.	C.E.	1907
Steinacker, Theodore	C.E.	1873
Stevens, Dana E.	C.E.	1913
Stevens, Frank J.	E.E.	1913
Stevenson, Ervin B.	C.E.	1907
*Stevenson, Holland N.	C.E.	1866
Stevenson, John D.	C.E.	1906
*Stevenson, P. E.	A.B.(r.s.)	1830
Stewart, Howard G.	C.E.	1908
Stieve, William M.	C.E.	1909
Stillman, Chester H.	C.E.	1906
*Stilson, William B.	C.E.	1867
*Stites, Archer C.	C.E.	1887
Stodder, George T.	C.E.	1863
Stone, Cyrus R.	C.E.	1867
Stone, Leverett C.	E.E.	1914
Stone, Lowell H.	C.E.	1869
*Storrs, Abel	A.B.(r.s.)	1831
Storrs, Arthur H.	C.E.	1883
Stow, Mulford	C.E.	1907
Stowell, Charles F.	C.E.	1879
Stowell, Ellery	C.E.	1872
Strasmer, C. F., Jr.	C.E.	1912
*Stratton, Norman	C.E.	1838
*Strawbridge, W. C.	M.E.	1870
Street, John Z.	C.E.	1912
Strenge, Karl O.	C.E.	1909
Stribling, Ben A.	C.E.	1886
Stringfellow, Henry A.	C.E.	1910
Stroud, Lamont R.	C.E.	1899
Stuart, Alfred A.	C.E.	1879
Stutz, Louis P.	C.E.	1909
Stutzer, Herman	C.E.	1878
*Suffern, Edward	C.E.	1835
Sugden, Clarence H.	C.E.	1889
Sullivan, Charles J.	C.E.	1913
Sullivan, Sylvester C.	C.E.	1914
Summer, Bernard	C.E.	1908
Summers, George J.	C.E.	1911
Sutermeister, A. H.	C.E.	1892
*Sutherland, M. A.	C.E.	1861
*Sutherland, S. W.	C.E.	1846
Swain, Donald B.	M.E.	1912
Swensson, Otto J.	C.E.	1909
Swift, Alexander J.	C.E.	1872
Sydow, John A.	C.E.	1914

* Deceased.

NAME.	DEGREE.	CLASS.
Sykes, George W.	C.E.	1893
*Symington, W. N.	C.E.	1861
Tapia, Ramon A.	C.E.	1908
Taylor, David B.	C.E.	1909
*Taylor, Gilbert T., C.E.,	B.N.S.	1844
Taylor, Harry M.	C.E.	1910
Taylor, Henry G.	C.E.	1913
*Taylor, Norman A.	C.E.	1902
Taylor, Presley M.	C.E.	1908
Taylor, Roger	C.E.	1899
Teiper, Frederic C.	C.E.	1911
Tenney, Arthur A.	C.E.	1904
Teran, Cesar	C.E.	1895
Terashima, Toyojiro	C.E.	1895
Terrell, John A.	E.E.	1913
Tessier, Rudolph F.	C.E.	1905
Thacher, Edwin	C.E.	1863
Thackray, George E.	C.E.	1878
Thiessen, Carl M.	C.E.	1913
Thiessen, Henry L.	C.E.	1909
*Thomas, Joseph	A.B.(r.s.)	1830
Thomas, Reuben D.	C.E.	1910
Thomas, Samuel R.	C.E.	1891
Thomas, William H.	C.E.	1891
Thomas, William S.	C.E.	1896
*Thompson, A. A.	B.N.S.	1838
Thompson, Alfred W.	C.E.	1907
Thompson, Arthur F.	C.E.	1910
Thompson, A. W.	C.E.	1892
*Thompson, Charles B.	B.S.	1860
Thompson, Clark W.	C.E.	1887
Thompson, D. B., C.E.'07,	E.E.	1911
*Thompson, E. Ray	C.E.	1876
Thompson, Gordon S.	C.E.	1905
Thompson, H. G.	C.E.	1898
*Thompson, James G.	B.N.S.	1848
*Thompson, John C.	C.E.	1865
Thompson, Mackey J.	C.E.	1893
Thompson, N. F.	C.E.	1907
Thompson, W. A.	C.E.	1869
*Thomson, James P.	C.E.	1888
Thomson, William S.	C.E.	1902
Thorn, Charles S.	E.E.	1913
Tonnelier, John E.	C.E.	1911
*Tibbits, George	C.E.	1841
Tiernan, Austin K.	C.E.	1894
Tighe, Stanley R.	C.E.	1907
*Tilghman, James. B.N.S.,	C.E.	1839
Tompkins, Daniel A.	C.E.	1873
Tompkins, John A. B.	C.E.	1879
Tone, Sumner L. R.	C.E.	1886
Toole, Ignatius V.	C.E.	1912
Torkington, Isaac	C.E.	1887
Torre, Alberto de la	C.E.	1897
Touceda, Enrique	C.E.	1887
Towle, Charles B.	B.S.	1898
Towne, Walter J.	C.E.	1895
Townsend, Frank T.	C.E.	1904
Townsend, John	C.E.	1879
*Trafton, Gilman	C.E.	1856
Travell, Warren B.	C.E.	1894
Travis, Charles B.	C.E.	1896
Treat, Robert D.	C.E.	1910
Trevino, Virgilio	C.E.	1912
*Trevor, Francis N.	C.E.	1866
Triol, Edward K.	C.E.	1906
Troeger, Maurice L.	C.E.	1909
*Trujillo, Francisco	C.E.	1857
Tsang, Lem Sec	C.E.	1912
Tuller, William H.	C.E.	1913
Tuller, William N.	C.E.	1908
Tullock, Seymour W.	C.E.	1877
Tumbridge, John W.	C.E.	1891
Tumbridge, Stanley S.	C.E.	1900
*Tuomey, Michael	B.N.S.	1835
*Turknett, Robert G.	C.E.	1886
*Turner, Benjamin	C.E.	1849
*Turner, Benjamin M.	C.E.	1888
Turner, Daniel L.	C.E.	1891
Turner, John P.	C.E.	1904
Turner, Raymond K.	C.E.	1913
Turner, Richard E.	C.E.	1905
Tuthill, DeWitt S.	C.E.	1904
Tuthill, James F.	C.E.	1898

* Deceased.

NAME.	DEGREE.	CLASS.
Tuttle, Frank W.	C.E.	1878
Tvete, Carl O.	C.E.	1905
*Tweeddale, William	C.E.	1853
Ubsdell, John A., Jr.	C.E.	1889
*Underwood, John C.	C.E.	1862
*Underwood, J. R.	C.E.	1875
Uribe, H. German	C.E.	1893
Utley, Charles H.	M.E.	1869
Valdes, Ciprian E.	C.E.	1913
*Van Bergen, R. H.	C.E.	1841
Van Buren, John D.	C.E.	1860
Van Buren, Robert	C.E.	1864
Van Burk, Louis	C.E.	1912
Van de Carr, Chas. R.	C.E.	1910
Van Denburgh, O. A., Jr.	M.E.	1913
Vandervoort, B. F.	C.E.	1908
Van Derwerken, E. G.	C.E.	1909
Van Duyne, Wilmer C.	C.E.	1907
Van Eman, Kenneth W.	C.E.	1913
Van Hoesen, Edmund F.	C.E.	1878
*Van Ness, Sherman	C.E., B.N.S.	1836
*Van Orman, Elmore S.	C.E.	1899
*Van Rensselaer, Alex	A.B. (r.s.)	1833
van Rensselaer, Allen	C.E.	1905
*Van Rensselaer, P.	B.N.S., C.E.	1839
*Van Schaick, A. P.	C.E.	1839
*Van Sinderen, A.	B.N.S., C.E.	1847
Van Zile, Harry L.	C.E.	1884
Varona, I. M. de	C.E.	1863
Vaughan, Edgar	C.E.	1894
*Vaughan, Frederick W.	C.E.	1863
Vega, Modesto de la	C.E.	1907
Verner, Henry W.	C.E.	1881
Verner, Morris S.	C.E.	1876
Vidal, José A.	C.E.	1912
Vier, Henry	C.E.	1883
Villa, Miguel	C.E.	1908
Vining, Merritt A.	C.E.	1913
Vining, Roy N.	E.E.	1912
*Viscarrondo, L. J. de	C.E.	1859
Volcker, Paul A.	C.E.	1911
Voorhees, Henry B.	C.E.	1896
*Voorhees, Herman	C.E.	1873
Voorhees, Paul	C.E.	1884
Voorhees, Theodore	C.E.	1869
Vosburgh, James C.	C.E.	1914
*Vought, Wm. G.	C.E., B.N.S.	1840
Vroom, Peter D.	C.E.	1862
Waddell, James A.	C.E.	1913
Waddell, John A. L.	C.E.	1875
Waddell, Montgomery	C.E.	1884
Waddell, Needham E.	C.E.	1908
Waddell, Robert S.	C.E.	1903
*Wade, James	C.E.	1842
Wagner, Richard G.	C.E.	1887
Wagner, Sanford M.	C.E.	1912
Wainwright, J. T.	C.E.	1875
*Waite, Christopher C.	C.E.	1864
Waite, Guy B.	C.E.	1888
*Walbridge, Russell D.	C.E.	1871
*Walbridge, T. Chester	C.E.	1873
Walbridge, Thomas H.	C.E.	1876
Wallbridge, William G.	C.E.	1877
Walker, Melville A.	C.E.	1912
*Walker, William W.	C.E.	1856
*Walker, William W.	C.E.	1886
Wall, Charles A., Jr.	C.E.	1913
*Wallace, Gurdon B.	C.E.	1840
*Wallace, James P.	C.E.	1837
Wallace, William M.	C.E.	1892
Waller, William	C.E.	1879
Walsh, George S.	C.E.	1894
Walsh, John E.	C.E.	1909
Walsh, Leo F.	C.E.	1912
Walsh, Thorpe T.	C.E.	1909
Walter, Albert G.	C.E.	1911
*Walter, Alfred	C.E.	1872
Walter, Frederick J.	C.E.	1910
Waltz, Joseph E.	C.E.	1877
Ward, Charles R.	C.E.	1895
Ward, Frederick	C.E.	1901
Ward, George M.	C.E.	1907
Ward, Vincent B.	C.E.	1886
Ward, Vincent M.	C.E.	1912

* Deceased.

NAME.	DEGREE.	CLASS.
*Ware, R. Willard	C.E.	1850
*Warren, Levi H	C.E.	1837
Warren, Ogle T	C.E.	1891
*Warren, S. Edward	C.E.	1851
Waterbury, Webster E	C.E.	1910
Watkins, Clarence B	C.E.	1903
Watkins, Frank B	C.E.	1912
*Watkins, Hezekiah	C.E.	1857
Watkins, Thomas L	C.E.	1907
*Watriss, George C	C.E.	1853
Watson, John H	C.E.	1904
Watson, Loyall F	C.E.	1907
Watts, John C	C.E.	1906
Way, Thomas L	C.E.	1909
Way, William F	M.E.	1913
Weaver, Charles J	C.E.	1906
Weaver, Frank R	C.E.	1909
Weber, Charles F	E.E.	1914
Weber, Daniel R	C.E.	1909
Weber, John L	C.E.	1910
Webster, James J	C.E.	1913
Weir, Charles G	C.E.	1877
Welch, John F	C.E.	1908
Wellington, George B	C.E.	1875
Wells, Joseph A	C.E.	1883
*Westcott, Amos	C.E., B.N.S.	1835
*Weston, Charles L	A.B.(r.s.)	1827
Weston, Charles S	C.E.	1882
Wheeler, Fred L	C.E.	1894
Wheeler, Robert O	C.E.	1912
*Whipple, Charles	C.E.	1837
*Whipple, Stephen T	C.E.	1838
Whistler, Thomas D	C.E.	1881
White, Alfred T	C.E.	1865
White, Fred B	C.E.	1912
White, James B	C.E.	1910
*White, John H	C.E.	1840
White, Walter A	C.E.	1912
Whitmore, Homer G	C.E.	1904
Whitner, James H	C.E.	1885
Whitney, Drake	C.E.	1864
Whitney, William E	C.E.	1896
*Whittelsey, P. D	A.B.(r.s.)	1834
Wiedeman, Herman F	C.E.	1912
Wigand, Albert A	C.E.	1889
Wiggins, Charles	C.E.	1878
*Wilde, Nathan R.	C.E., B.N.S.	1836
Wiley, William H	C.E.	1866
Wilhelm, Eugene B., Jr.	C.E.	1908
Wilke, Robert F. T	C.E.	1907
Wilkins, Wm. G	C.E.	1879
*Wilkinson, Alfred	C.E.	1849
*Wilkinson, J. F	C.E.	1847
*Wilkinson, Wm	A.B.(r.s.)	1830
Wilkinson, Wm. M	C.E.	1910
Williams, Allen	C.E.	1903
*Williams, Clifton G	C.E.	1877
Williams, Frank I	C.E.	1910
*Williams, James B	C.E.	1888
Williams, Jerome H	E.E.	1913
*Williams, J. Francis	C.E.	1883
Williams, John H	C.E.	1913
*Williams, Norman A	C.E.	1859
Williams, Parley L., Jr.	C.E.	1900
Williams, Samuel W	C.E.	1894
*Williams, S. Wells	A.B.(r.s.)	1832
Williams, Theodore H	C.E.	1889
*Williams, W. B	C.E.	1835
Williams, Wynant J	C.E.	1905
Williamson, T. M	M.E.	1871
Willis, Harry A	C.E.	1909
Willson, Frank J	M.E.	1911
Willson, F. N	C.E.	1879
Wilson, Henry F	E.E.	1914
Wilson, Henry W	C.E.	1864
Wilson, Howard M	C.E.	1884
Wilson, James B	C.E.	1899
*Wilson, James M	C.E.	1887
*Wilson, John A	C.E.	1856
*Wilson, Joseph M	C.E.	1858
Wilson, Loyd	C.E.	1903
*Winger, Oswald E	C.E.	1886
*Winslow, Charles W	C.E.	1858
Wirth, John	C.E.	1903

* Deceased.

NAME.	DEGREE.	CLASS.
Witbeck, LeRoy D	C.E.	1912
Witmer, Joseph F	C.E.	1887
Witmer, Victor M	C.E.	1887
Wolf, Benjamin B	C.E.	1914
*Wood, Charles W	C.E.	1884
*Wood, De Volson	C.E.	1857
Wood, Guy S	C.E.	1912
Wood, Stanley	C.E.	1914
*Woodruff, Joel R	C.E.	1847
*Woodward, F. G	C.E.	1839
*Woodworth, B. B	A.B.(r.s.)	1833
*Woodworth, John, Jr	C.E.	1837
Wooley, W. Thomas	C.E.	1900
Worcester, George W	B.S.	1887
Worden, Charles A	C.E.	1904
Worthington, Charles	C.E.	1892
*Wotkyns, A. A	C.E., B.N.S.	1847
Wright, Carl J	E.E.	1913
Wright, Josiah P	C.E.	1900
Wu, Ng Chee	C.E.	1913
Yardley, Edmund	C.E.	1856
Yates, Preston K	C.E.	1880
Yeager, Frederick A	C.E.	1878
Young, Don Carlos	C.E.	1879
*Young, Feramorz L	C.E.	1879
*Young, Frederick S	C.E.	1880
Young, Horace G	C.E.	1877
Young, Jonas F	C.E.	1872
Young, William H	C.E.	1902
Yunker, Conrad V	C.E.	1900
*Zabriskie, Aaron J	C.E.	1876
Zahnleiter, Albert W	C.E.	1908
Zane-Cetti, Carolus H	C.E.	1897
Zayas, Octavius A	C.E.	1886
Zegarra, Enrique C	C.E.	1874
Zeigler, Henry J	E.E.	1914
Zimmermann, Paul G	M.E.	1913

Number of Graduates to and including the year 1914–

Living	1558
Dead	559
Total	2117

* Deceased.

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